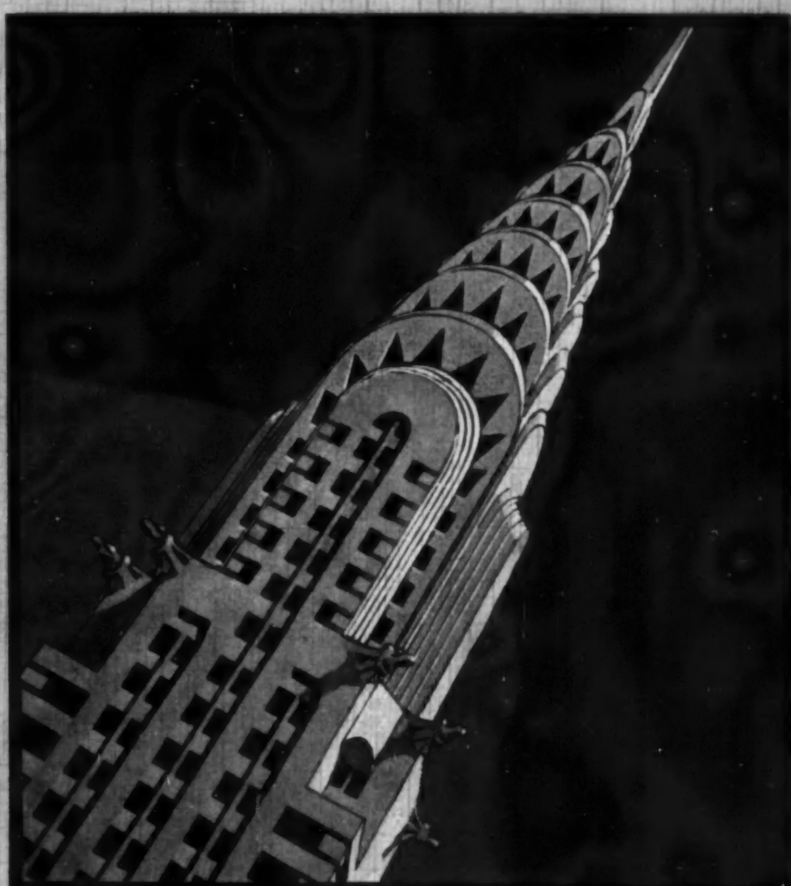
THE ARCHITECTURAL FORUM



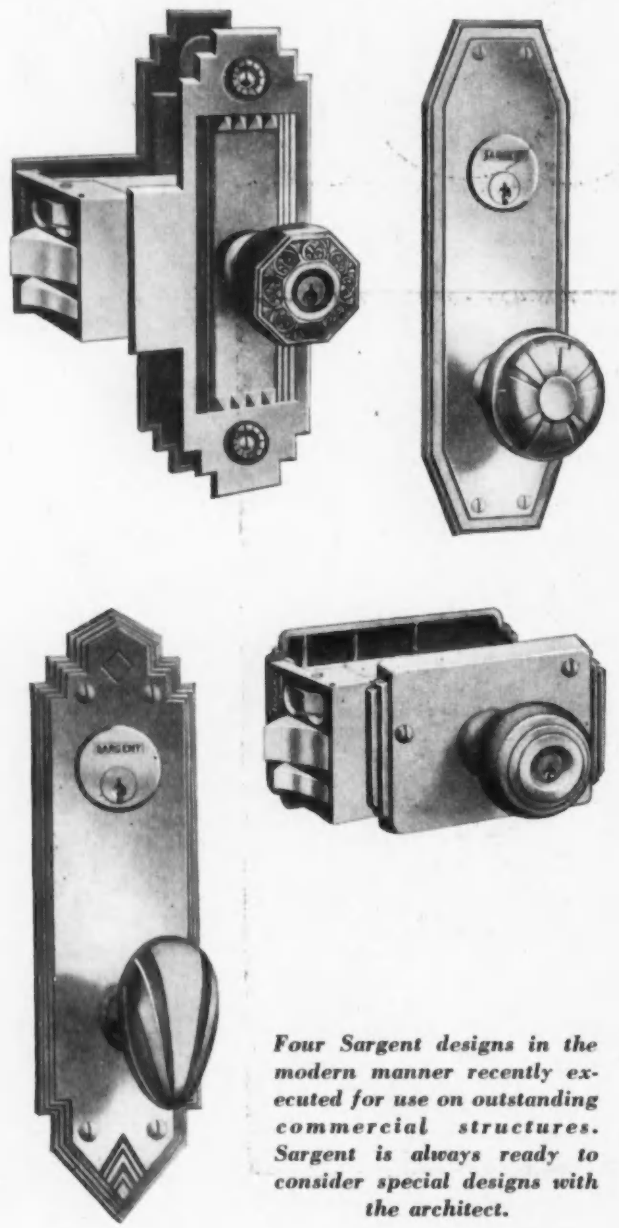
IN TWO PARTS PART ONE

ARCHITECTURAL DESIGN

OCTOBER 1930

CONTEMPORARY

DESIGNS THAT HARMONIZE



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BOOK DEPARTMENT

ENGLISH MONASTERIES IN THE MIDDLE AGES

A REVIEW BY

CLIFFORD WAYNE SPENCER

RECORDING the rise, progress, decline and fall of English monasticism has for centuries engaged the attention of students and scholars. The causes for its growth are not hard to discover. During the mediæval period the instability of general conditions everywhere in England drove into the cloister many who had little inclination for the religious life itself, but who valued the quiet, order, security and opportunity for study which life within a monastery or convent not only promised but gave. Then again, the monastic orders performed many of the functions which today would be fulfilled by hotels and institutions of public charity. Hospitality was supplied to travelers, and the poor were fed at the convent gate, while the convent's infirmary cared for the sick and its almshouse for the aged poor. Perhaps it was the very growth and prosperity of monasticism which brought about its fall. Hard work and frugal living would make anyone rich, but toward the middle of the Tudor period the monastic orders owned an astonishingly large proportion of all the land in England. Their vast buildings, many of which still exist today, dominated the land, and with vast wealth there came increasing arrogance on the part of the Church's leaders,—a pomp and circumstance and manner of living which excited even the royal jealousy. In the person of Cardinal Wolsey there might be said to have been an epitome of the entire situation as it existed during the sixteenth century.

Canterbury Cathedral Priory.
The Treasury

Many scholars and students have written regarding the political and economic aspects of monasticism, but not so many have devoted themselves to what might be called its architectural phase, developed during centuries with rare taste and skill, and backed up by resources so abundant that the result was a system of monasteries, abbeys, priories, convents and other structures which ranked well among the architectural glories of the world.

In this volume the architectural aspect is covered well. These buildings could scarcely be understood without some explanation of the life lived within them, and to describing this life a considerable part of the volume is devoted. A large religious house would be planned to accommodate a considerable number of professed monks and probably a still larger number of lay brothers engaged in the domestic duties of the house, its various workshops, its guest house, infirmary, and all the departments which had to do with farming upon what was often a large scale. The devotional side of life required a choir of vast size, wherein several hundred could gather, seated according to rank; a presbytery or sanctuary proper; a nave for the neighbors of the monastery or abbey; enclosed cloisters which would insure the peace and quiet which such an establishment demanded; and finally the dormitories, refectories, kitchens and all the other buildings which were necessary. And since notwithstanding the character of the house,—since it was often necessary to serve Mammon as well as God,—provision must be made for collecting tithes or rents for such property as could not be operated by the religious themselves. The great wealth of the monasteries aroused the envy of secular rulers, and there were not lacking circumstances which afforded a pretext for confiscating this wealth,—shattering the monastic system, and rearing upon the wreck a new system of religion and a newly founded nobility likely to strengthen the hands of the aforesaid rulers secular.

In order to properly present the subject, Mr. Palmer deals *in extenso* with quite a number of old monastic groups which still exist in England. Many structures now being used as the cathedrals of various dioceses

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of the Church of England were monasteries in Catholic days, which accounts for the great space given up to the choir, built for the use of a large number of monks and lay brothers, but now more than adequate for the small congregations which can be mustered in some cathedral towns. The author presents views of the exteriors and interiors of many such buildings, and diagrams which give the student an idea of the plans of the buildings and their relation to other structures which composed the monasteries.

The principal purpose of the volume is to present in a complete form information as to the architectural styles which were the product of the great monastic orders. Much of this material has been presented before, but usually in the form of isolated bits found here and there as parts of more general treatises or as the subject of monographs or brief papers. The organizations of the great religious centers, especially after the Church had acquired great wealth and power, were so complicated and extensive as to require quite a collection of buildings in which to carry on the various functions of administration and religious life. The very nature of the life led by the inhabitants of the monasteries called for a form of architecture which is said to have produced the "kindest and most loving of all the buildings that the earth has ever bourne." The keynote of monastic life was quiet and seclusion. This called for massive walls to shut out the outer world, and for secluded cloisters in which the brethren might walk in quiet contemplation or consult with their fellows on heavenly matters. The great walls also sometimes served the double purpose of acting as safeguards against marauding outlaws and jealous kings or nobles. Then too, there must be space provided to house the weary traveler, in addition to the cells of the monks and the lay brothers. Great quantities of stores were collected from their constituents or harvested by the monks, and space for storage must be provided. Another incentive which no doubt actuated the ecclesiastical rulers of that day to erect impressive buildings was the necessity of inspiring both the members of the organization itself and the surrounding peasants and yeomen with proper respect and awe. The best way of conveying to people a sense of the importance and permanence of an institution is by housing it in buildings whose very structure suggests these qualities. A present-day manifestation of this fact is found in the ponderous buildings in which banks and other financial institutions are wont to house themselves. The intellectual pursuits of the monks provided them with the opportunity to become students of architecture and gave them access to material which helped greatly in the proper planning of the buildings. In addition to all these factors in favor of a happy architectural development, there was the very great advantage of having an abundance of free or inexpensive labor and almost unlimited material resources. Here we have a combination of all the underlying factors that go to produce a worthwhile type of architecture,—namely, the desire and necessity of building; ample time for study and research in planning; and abundance of material resources. Is it any wonder, then, that they were so successful in producing buildings that have outlasted the centuries, both in their resistance to the forces of nature and in their power to impress us with a sense of their great beauty and correctness of design?

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Since such a large part of the interest contained in any group of buildings is functional, it is important that the student be familiar with the organization of the group which they were designed to serve in order to truly appreciate their merit. Without such knowledge a rambling collection of buildings may have very little meaning to the casual observer, but to one who realizes that the buildings are well understood; here the prior directed the activities of the great institution, there the monks walked up and down with bowed heads and measured tread, or stood in little groups engaged in carefully supervised conversation, and this was the chapel where the monks sat in the great choir while the surrounding country folk occupied the nave. The true meaning of the various forms and layout are apparent, and are possible of understanding and appreciation.

Some understanding of the several orders that flourished in England during the period of the middle ages is also desirable for an appreciation of their architecture, and the author has devoted a chapter to this subject covering the rise of Benedictinism and describing the three more important orders, the Benedictines, Cluniacs, and Cistercians in a more detailed fashion. The description of the monastery as an organism, furnishes the proper background against which to present the architectural data which comprise the major portion of the volume. The different officers, their places and duties in the organization, from the abbot down to the kitchen menials are discussed, and they include a great number of church and administrative functionaries such as the prior and sub-priors, the master of novices, the *obedientiars*, the preceptor, the succentor and the sacrist, while on the administrative side there were the cellarer, the fraterer, the infirmarer, the chamberlain, the almoner and the hosteller. The places where these men performed their duties comprised the buildings of the monastery, and their daily lives as sketched by the author are full of interest both to the student of architecture and the general reader.

Having thus made us acquainted with the men who inhabited the buildings, Mr. Palmer gets down to serious architectural discussion and takes up the plan on which the monastic buildings were laid out as typified by some of the more important establishments in England. There are plans and diagrams to show the variations occurring in various places and to help trace the development of the early monastic church plan into the more elaborate later forms. The various parts of the churches are discussed, and the influence of the historic styles of architecture and of the different orders on the architecture are pointed out. For instance the Cistercian churches in England developed under the influence of precedent from Burgandy, the Ile de France and Normandy, and of English Romanesque with a later transition to Gothic influence; all subject to the modification which was the natural outcome of a regime which emphasized simplicity in life. The monks felt themselves free to break away from the current practice and traditions and to build simply to suit their needs. As these needs multiplied and became more exacting, the plans of the churches reflected the greater complexity of the organization, and a type was developed which on further development became the basis for the plans of such great cathedrals as York, Ely, Lincoln and old St. Paul's. The most important part of the monastery

was the cloister, for it was here that the monks of the choir lived, studied and meditated. As it usually consisted of four colonnaded walks, it afforded opportunity for interesting architectural treatment. A chapter of the work is devoted to this portion of the monastic group, being illustrated from photographs of cloisters from some of the most beautiful English cathedrals and abbeys. The extra-claustral buildings include the infirmary group, the abbot's lodging, the guest houses and almonry, schools, almshouses, lay infirmaries, gatehouses and other minor buildings and furnish the subject matter for still another chapter of this fascinating volume. The design and actual building of the institutions are considered under the chapter heading, "The Master Builder," and is most interesting, especially to the architectural reader, since it describes the building organization and tells something of the manner in which the drawings of the mediæval architects were made and how the actual work was carried on. Still another chapter is devoted to the same subject under the heading of "The Building of a Monastery," describing the various craftsmen and the way in which they carried on their work both before and after the conquest. It is greatly to be regretted that the English monastic system was so completely shattered as to bring about the actual destruction of a large part of their buildings, but works such as this will do a great deal in preserving for posterity the information still available on the subject.

ENGLISH MONASTERIES IN THE MIDDLE AGES. AN OUTLINE OF MONASTIC ARCHITECTURE AND CUSTOMS FROM THE CONQUEST TO THE SUPPRESSION. By R. Liddesdale Palmer. 233 pages, 7¼ x 8¾ ins. Price $8. Richard R. Smith, Inc., 12 East 41st Street, New York.

SHADES and Shadows, Perspective Drawing, Classic Orders, Elementary Principles of Architectural Rendering and Architectural Lettering are the subjects of the five chapters included in this excellent text book for architectural students. The analyses and presentations of the various problems are set forth in an easily understood manner as a result of the author's ten years' experience in classroom instruction. It is a text book in the true sense of the word, and is a means of conserving the valuable time of the teacher. The scheme of presentation is to include the methods used in actual practice with all of their time-saving advantages, all of which are based on scientific analyses. The scope of the presentation includes those principles that are constantly arising in practice. The work is not over-extended into unusual problems which are wasteful of the student's time, but it is sufficiently comprehensive to enable one to apply the principles illustrated to the most complex problems. The technique of rendering drawings is explained in considerable detail, with especial attention to the French method of laying washes.

The title of the work is misleading, since its contents pertain to architectural drawing and presentation only and are not related to architectural design in the common acceptance of that term. However, it is a valuable text book for the student, and useful for ready reference when it is desirable to renew one's knowledge of seldom-used methods.

FUNDAMENTALS OF ARCHITECTURAL DESIGN. By W. W. Turner. 175 pages, 11 x 15 inches. Illustrated, cloth. Price $6. McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York.

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THE EDITORS' FORUM

S. W. STRAUS

ARCHITECTURE lost a distinguished friend and a valuable aid in the death during September of Simon William Straus, head of the great New York banking institution which bears his name. Widely known as a philanthropist as well as a banker, Mr. Straus was the originator of the modern first mortgage real estate bond and was a pioneer in the development of the American skyscraper. He was born on December 23, 1866, in Ligonier, Ind., son of Frederick William and Madlon Goldsmith Straus. His forefathers were bankers. Mr. Straus, who moved to New York in 1915, financed the Chrysler, Chanin, Westinghouse and Fisk Buildings, as well as many apartment houses, including that at 277 Park Avenue. In 1924 he built an $18,000,000 office building in Chicago.

Several years before he had taken over one of the largest chains of hotels in the country, including a construction program of $20,000,000. The Ambassador Hotel in New York, where he lived and died, and its namesake in other cities are parts of the chain. The $4,000,000 Straus Building on Fifth Avenue, which he built, is said to contain one of the finest banking rooms in America. Although a stern disciplinarian, Mr. Straus was a man of even temperament, who commanded great respect and affection among his employes. Not even the most timid office boy feared to approach him, it is said. Many hard luck stories were heard by him, and no worthy case was turned away. He had only two hobbies,—charity and thrift. He was founder and president of the American Society For Thrift, in which he was long interested, and he was identified with many societies.

FREDERICK W. WINTERBURN

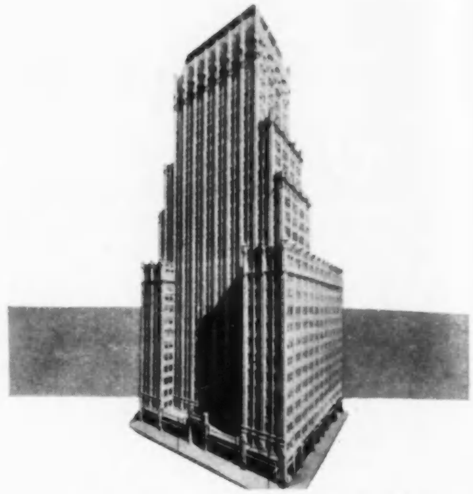
THE death of Frederick W. Winterburn occurred on September 4 at Pocantico Hills, N. Y., in his 81st year. He was given a degree by the Kensington Art School at the age of 22, and in 1885 he was connected with the New York architectural firm of Clinton & Russell. Among the churches which Mr. Winterburn designed is All Angels' in West End Avenue, New York, and Christ Church, Tarrytown, of which he was warden.

EXHIBITIONS IN BOSTON

DURING the past few months there have been held a number of notable exhibitions at the Boston Museum of Fine Arts. During June there was displayed an extremely fine and interesting collection of Dutch East Indian textiles, assembled by A. J. C. Van Kerckhoff of The Hague. Many of them are Ikat work, that is, textiles in which warp threads, and sometimes both warp and weft threads, have been tied and dyed before weaving. The resulting patterns have slightly blurred or soft edges. There are many types of patterns illustrated, but especially notable are those in which vertical and horizontal bandings have been used. The colors are rich and deep in tone, enlivened by notes or bands of brilliant color which complete the distinction and unity of the patterns. The surface of many Ikat examples is not unlike that of rare carpets from the Persian looms. Influences from Persia, India, and the Occident appear, but so carefully have they been blended with their own more primitive ideas that the resulting patterns are thoroughly expressive of their island culture. The collection at the close of the exhibition was returned to Holland.

In connection with the tercentenary of the founding of the Massachusetts Bay Colony the Museum has held recently an exhibition of authentic portraits of distinguished members of the Colony. It is probable that the few known portraits of the founders of the Massachusetts Bay Colony were painted when the sitters were abroad on political or commercial missions, or by itinerant artists making brief sojourns in this country. But the growing vogue of portrait painting in England was soon reflected in the Colony, and by the close of the seventeenth century an appreciable number of artists were at work here. But it is John Singleton Copley, foremost among colonial painters, who has left the most complete record of important personages of his day, immediately preceding the Revolution. He moved to England in 1774, where he lived until his death in 1815, and it was prior to this migration that all the portraits in the exhibition and most of the "Copleys" in American collections were painted. Among those on view are Edward Holyoke, President of Harvard University, 1727-69, seated in the three-cornered chair still treasured by the University; of Robert Chamblett Hooper of Marblehead, familiarly known as "King" Hooper; William Brattle and his friend, General Gage, Military Governor of Massachusetts; Samuel and John Adams, John Hancock and Dorothy Quincy, Mr. and Mrs. James Otis, and others eminent in colonial history. Of a little later date is Edward Savage's likeness of Robert Treat Paine, Delegate to the Continental Congress, Signatory of the Declaration of Independence, and Judge of the Supreme Court.

For the "Hamilton Palace Room," one of the period rooms in the Museum and among the many gifts of the late Mrs. Frederick T. Bradbury, there has been secured a portrait by Van Dyck of Isabella, Lady De La Warr. The subject of the newly acquired painting is a young woman of distinguished lineage and great beauty, whose charm the painter has portrayed with rare skill. She is gowned in silver-gray, low-cut, and lace trimmed. With her left hand the skirt is caught up, while the right hand is extended toward a small dog playing at her feet. In the background there is a characteristic treatment of deep red hanging and a landscape vista. The portrait has always remained in possession of the family and has only recently come on tne market from the collection of Reginald Windsor Sackville-West, 7th Earl De La Warr, of Buckhurst. He belongs to the Sackville-West family, owners of Knole, from whence came the Gothic tapestry recently presented to the Museum by Robert Treat Paine, 2nd, and now hanging in the Tapestry Gallery.

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THE
ARCHITECTURAL
FORUM

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THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

FROM A PAINTING BY
CHESLEY BONESTELL

The Architectural Forum

THE ARCHITECTURAL FORUM

VOLUME LIII

NUMBER FOUR

OCTOBER 1930

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THE CHRYSLER BUILDING, NEW YORK

WILLIAM VAN ALEN, ARCHITECT

BY

EUGENE CLUTE

THAT the Chrysler Building over-tops every other completed structure, including the Eiffel Tower, is sufficient to give it great interest for the general public, but to the architectural profession its originality of design, embracing many novel features that are logically developed, is far more significant. Its massing, silhouette and surface treatment, its studied use of fenestration as an element in design, and the unusual handling of materials, all are extremely interesting. Then, too, the straightforward meeting of the various requirements of the problem in plan and elevation commands attention.

Seen under different conditions, this building takes on varied expressions of unusual beauty. In the sunlight the great dome-like crowning feature of the tower, sheathed in polished nickel chrome steel, appears like some gigantic work of the silversmith. Again, it seems to be of blown glass, the reflections in the shining surface creating the illusion of transparency. Often it melts into the sky as a part of a scheme of soft gray tones.

The tower rises in impressive, unbroken vertical lines from the four-story portico at the center of the Lexington Avenue front to the great semicircular dormer head 69 stories above the street. The dome grows out of the tower; its surfaces are carried down between the dormers, the sides of which are splayed and metal-sheathed, tying it to the tower. The dome above repeats upon its surfaces the semicircles of the dormer heads, elongated so that they grow more slender with each of the seven repetitions until they reach the base of the tall needle-like finial of polished nickel chrome steel, the top of which is more than 1,050 feet above ground. The tower is firmly planted in the base formed by the lowest four stories and is buttressed at the north and south by setback masses so composed, proportioned and treated as to surface, that each has the character suited to its functions in the design, by which unity is secured.

The lowest of the flanking masses, great squarish blocks, have the proper air of immobility, due to their proportions, fenestration, and their surface treatment. Here the windows are evenly spaced in gridiron formation, and the facing of the walls is of light gray brick with inset strips of white marble forming a pattern of squares that is relieved of mechanical hardness and given life by the arrangement of the lines to suggest the interlacing of a basket-weave. The general effect is that of squareness; the verticals and the horizontals balance; there is no movement excepting the vibrancy of the surface treatment. There are 16 stories from the sidewalk to the first setback.

From the first to the second setback, a height of seven stories, verticality is emphasized; there is an ascending movement. Piers of white brick alternate with vertical lines of windows. The spandrels are of aluminum, neutral in general tone to merge with the window openings above and below them, but they are enlivened by high lights on the burnished portions of the relief ornamentation. Upon the corners at the second setback there are large nickel chrome steel ornaments of urn-like form but of modern design. They are formed from sheet metal and have steel reinforcement within.

From the third to the fourth setback there are three stories, marked with horizontal banding, that separate the masses below from those above. The next four stories, the 28th to 31st, are so treated that they mark the point at which the tower emerges from behind the flanking masses and effect the transition from these masses to the tower. These stories project but little beyond the north and south faces of the tower,—about

42nd Street, Looking East from Public Library

10 feet,—and are flush with the east and west walls of the tower. The four corners at this level are extended in an outward and upward movement, and each is crowned by a huge ornament of nickel chrome steel in the form of a winged helmet of Mercury, the design of the Chrysler radiator cap. The wall surfaces here show a conventionalized design in gray and white brick, representing racing automobiles with hub caps of polished steel. The treatment of these four stories is expressly intended to attract the eye to this point and give the necessary width to the tower where it emerges from the setbacks, overcoming an optical effect which would otherwise cause the tower to appear wider at the top than at this point.

The surface treatment of the shaft of the tower is one of the most interesting features of the building and one of the most effective as well. The strongly marked group of vertical lines in the center of each face of the tower increases its apparent height, an effect that is accentuated by contrast with the horizontal banding carried around the corners of the tower.

This banding is produced by grouping the windows horizontally through the use of courses of black brick above and below the windows as well as by use of piers of black brick between them. This brick, being glazed, catches the same high lights as do the glazed window openings and has practically the same tone values. At the corners the courses of black brick are carried around, leaving rectangles of white brick that give an effect very like that of quoining.

This horizontal banding creates a remarkable impression of lightness, as one floor above another is emphasized and the verticals are suppressed. The genesis of this happy treatment of the tower was structural and came about quite naturally, for the earlier studies of the design for this building showed a tower on a Maltese cross plan. When the plan of the tower was made rectangular, the features arising from the original plan became a decorative surface treatment in white, gray and black brick, that gives depth, lightness and vibrancy by very simple means.

In the 60th and 61st stories the plan of the tower is in the form of a Maltese cross, bringing about the transition from the square shaft of the tower to the finial. Here are eight large gargoyles of nickel chrome steel in the form of an eagle's head, modeled in great simple planes and made from sheet metal.

Throughout the next six stories the great dormers rise to the base of the dome where the surfaces are pierced with triangular windows and ribbed with radiating lines of polished steel that scintillate in the sunlight and give life to the dome. At the 71st floor level, which is marked by the second row of triangular windows, there is an observation gallery, which is spacious. This gallery follows the octagonal form of the perimeter of the tower and surrounds an octagonal space in which are grouped the elevators and various utility features. The ceiling is high. At points along the outer wall of the gallery, where heavy members of the structural steel slant inward from floor to ceiling, these members have been encased and the resulting form has been repeated upon the inner side of the gallery. This produces a series of openings which provide effective visits from one section of the gallery to another. Here, enclosed in a glass case, is Walter P. Chrysler's box of workman's tools with which he started his career. This gallery provides pleasant surroundings from which visitors may enjoy the remarkable views of New York and adjacent counties that can be had through the wide windows on every side.

Approaching the Chrysler Building along the street, one sees the four-story base faced with

black Shastone granite sparkling with the iridescence of this material and further enlivened by the gleam of polished nickel chrome steel window frames and store fronts. At the center of the Lexington Avenue front, and of the 42nd Street front, there are great deep portals that rise through the lowest three stories and that are framed and faced with black Shastone granite. Over the main entrance on Lexington Avenue there is a large reproduction of the Chrysler radiator cap, in cast aluminum, that serves as a flagstaff holder. Within these portals are tall screens of polished nickel chrome steel and glass above the doors. At night the portals are illuminated by indirect lighting through these glass screens. Back of the glass there is a recess equal in depth to the diameter of the revolving doors beneath. Reflector strips set at the sides of the openings direct their light upon the white painted plaster surface, from which it is reflected and diffused through the glass.

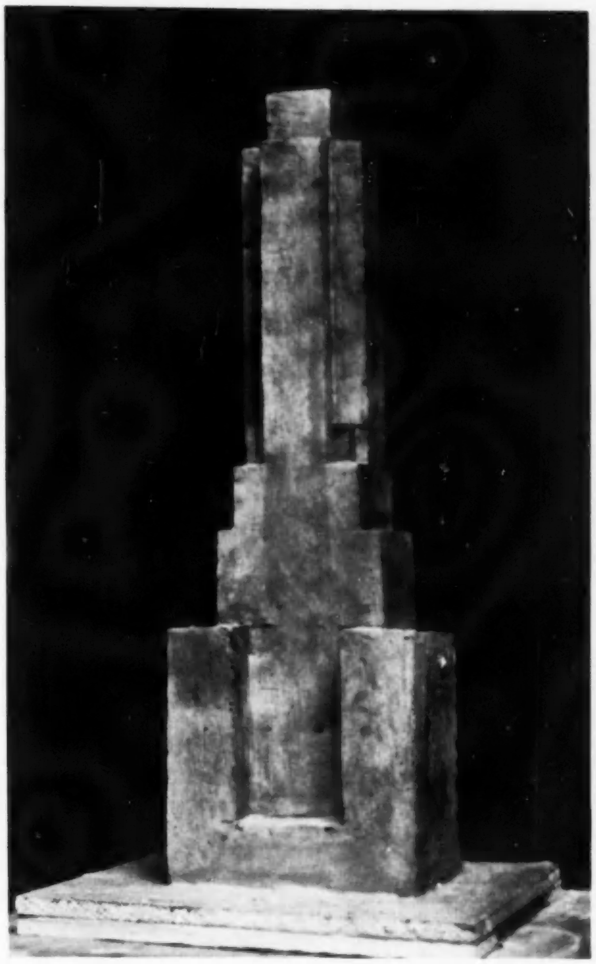
Passing through the main entrance on Lexington Avenue one enters the triangular lobby, which spreads out toward the elevator lobbies opposite. People entering are guided to the four banks of elevators by clearly legible illuminated directional signs; the lines of travel radiate from the entrance, and there is no congestion or confusion. The pattern of the Siena travertine floor follows these radiating lines, and between the slabs of stone are narrow dividing strips.

The walls of the foyer are faced with Rouge Flamme marble, rich red with bold and varied markings in tones of buff. This marble is used in immense slabs, and the wall surfaces are unbroken. Just inside the entrance at right and left are store fronts with beautifully wrought ornamental crestings of nickel chrome steel. The large directory frames on the main walls of the foyer are executed in the same material. Directly opposite the main entrance is the information booth, back of which is a tall niche treated in wrought nickel chrome steel and surmounted by a clock with a light source of amber onyx and polished steel above it.

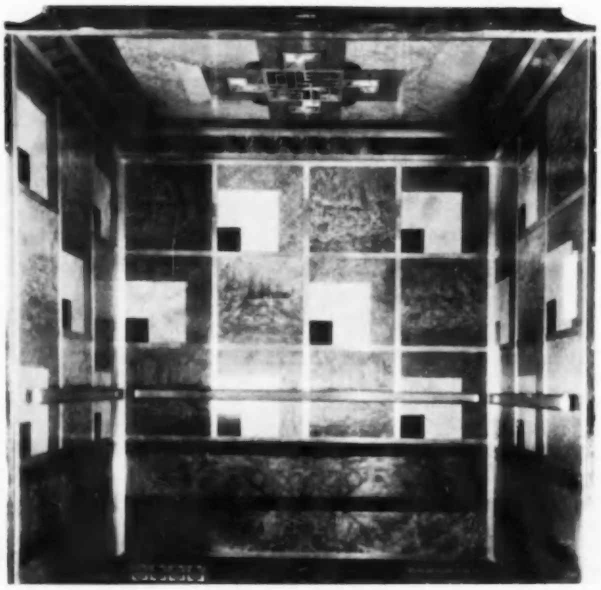
The entire ceiling is covered by a mural painting by Edward Trumbull in which rich warm colors predominate, toning in with the coloring of the marble walls. This ceiling is slightly stepped-up in triangular planes from the entrance to the opposite wall.

Set in the walls above the entrance to each of the four elevator lobbies there is a light source consisting of reflecting surfaces of honed, Mexican onyx of amber color, and vertical reflector troughs incased in nickel chrome steel. In plan the reflecting surfaces present a series of triangles, side by side with the reflector troughs placed somewhat in advance of them. This provides a wide and even distribution of the light, and the dull surface of the onyx does not reflect any image of the lamp filaments. Over the doors of the Lexington Avenue entrance, and recessed in the octagonal piers, there are light sources of similar character. The lighting of the lobby is entirely indirect, from such sources as have been described. The lamps used are white, but the light reflected into the room takes on an amber color from the onyx surfaces and is tinged with red by the marble walls, with the result that the diffused light is warm and pleasing in color.

In the eight banks of four elevators each, no two elevator cabs in any bank are alike in design or coloring. They are lined with inlays of beautiful woods in modern designs, and the elevator doors are covered with a large-scale motif in wood inlay outlined in white metal. This variety in the treatment of the elevator cabs relieves monotony and gives them individuality.



Model of Early Study for Massing of Chrysler Building, Showing Tower on Maltese Cross Plan from Which Was Evolved the Decorative Surface Treatment of the Square Tower

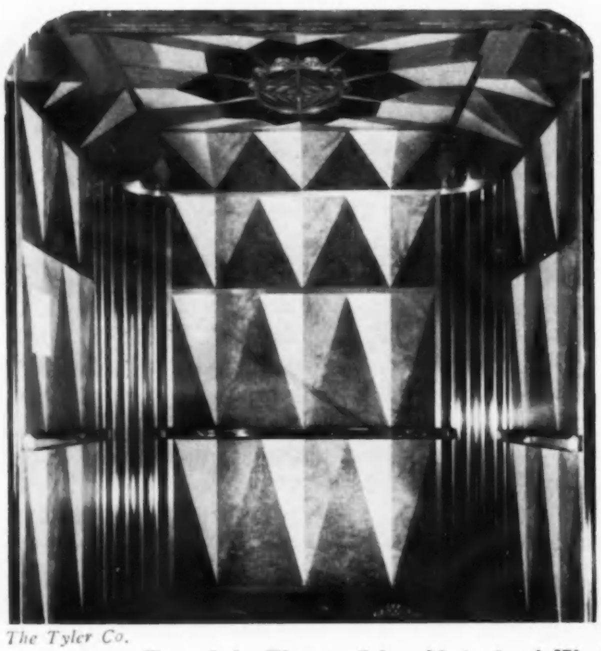


One of the Many Elevators. There are Fans in the Centers of the Ceilings of the Cabs

To the north and south of the main lobby broad corridors, upon which several stores open, lead to 43d and 42nd streets respectively. There are two grand staircases opening from these corridors. They extend up to the second floor and down to the basement with its shops and subway entrance. The walls of these staircases are of polished black marble veined with white, and the ceilings are finished with aluminum leaf. The stairs have terrazzo treads of a gray and black mixture, and the risers are of the polished black marble. The stair railings are of polished nickel chrome steel in a modern design, and the massive square newel posts are of Rouge Flamme marble. Suspended from the ceiling of each of these staircases is a large lighting fixture of glass and nickel silver, of general cylindrical form and modern design.

Among the many interesting details of the design of this building are the aluminum window sills which are used throughout and the bright steel copings on the low parapets of all of the setbacks, with guard rails of aluminum above them. The care with which every detail of the design has been studied in the materials is shown by the horizontal banding in gray and white upon the brick spandrels in the central portion of each face of the tower to give them the tone required to bind the verticals together. Even the sidewalk has been made part of the design, for it has been laid in bands of gray and sparkling black that form paths for the pedestrian traffic.

The design of this building presents interesting solutions of so many of the problems involved in the creation of a modern style of architecture for our tall buildings that it is particularly worthy of thoughtful study. The design has been based on our present-day steel-frame construction, and the massing, fenestration and surface treatment, instead of following the traditional architectural forms, have been depended upon to give the design a unique character. It does not reflect the past, but is an expression of the intense activity and vibrant life of our day.



The Tyler Co.

Two of the Elevator Cabs. Vari-colored Woods Add Interest and Individuality to the Interiors

ROME AFTER THIRTY YEARS

BY

KENNETH M. MURCHISON

YES, it is still there. And what a place! Who made all the full size details? And how did they know so much in those days?

Not only of the Romans do I speak, but of the masters of the Renaissance as well, masters in every sense of the word; masters of proportion, of color, of materials.

It is absolutely astonishing to one who has not been there for a long time. And there's an eye-ful for the architect at every turn.

The scale of the old churches and fountains and palaces is magnificent; the rear of St. Peter's, as well as the front, is studied to the last notch, and every moulding seems just what it should be. Then, of course, the beauty of the old travertine stone itself materially helps the whole effect. Clever, those *Cinquecentos!*

But on the inside of these structures, the more one examines the details the more one is struck by the absolutely the-sky's-the-limit point of view of the builders. Yes, sir! the rarest marbles and the most intricate bronze work are thrown around as if they were all imitation! Even in obscure, dimly-lighted chapels and apses there is a wealth of ornament which makes one hasten to the nearest cafe and indulge in three hearty *vivas* and three glasses of Marsala without stopping.

THERE'S "WELCOME" ON THE DOORMAT

A godsend to the visiting architect is the American Academy in Rome, situated high up on the Janiculum Hill in its own McKim, Mead & White structure. A happy band of students in architecture, sculpture, painting, landscape architecture, music and the classics. They took me to their ample bosom like the She-Wolf entertained Romulus, and they guided me in all sorts of pastures ancient and modern, in and out of the taxi lanes and along fascinating byways.

But in Rome, why don't *all* the jay walkers get killed in the streets? That's what I want to know. They absolutely refuse to walk on the sidewalk, even when there is one, and they tack across the cobbles in every known direction and always walk *with* the traffic. The taxi men, being fond of light opera, blow their treble horns without pause, and just as they get up to a pedestrian, said pedestrian steps lightly to the right, with the breath of the Fiat fairly scorching his pants, and thereby has his 47th narrow escape for that hour.

I used to shiver and shake continuously, even with the driver and two panes of glass between me and the victim, but nothing ever happened! No one was worried. Everybody kept in the middle of the street just the same. And everyone I saw was as agile as a flea,—and there are still fleas in Rome.

IL DUCE!

Mussolini and his lieutenants have made a marvelous change in Italy. Everything there is under the jurisdiction of a most intelligent leadership. Everything is regulated. Everybody is at work. Tips have been abolished everywhere, replaced by a 10 per cent service charge. No beggars. Very little short-changing. Few street cars, but lots of busses, such as there should be in New York and are not.

Everybody is busy and in a hurry. For the most part they don't get much, but they seem to be happy. They get their wine at reasonable prices, without paying the bootleggers' 500 per cent profit, and they have certainly gotten everything possible out of the lowly macaroni family. It takes the first nine years of an Italian's life to learn how to roll his spaghetti on his fork and then flip it into the *bocca* without any of it flying down his collar! The Italians, however, are not so good on popular songs. All that old Neapolitan stuff like *"Sole Mio"* and *"Addio, Bello Napoli"* still goes big, but no Italian guitar player that I heard has mastered the correct accompaniment of *"Funiculi."*

ACADEMIA AMERICANA

But back to the American Academy. I hardly believe that many of the architects over here realize what an important center it is and, incidentally, how much it costs to run it. It is a grand institution, and those young *Michelangeli* of the modern artistic world are to be envied by all their brethren. They are housed perhaps too well for students, but they live and work together in a buoyant atmosphere and show splendid results.

Gorham P. Stevens is the Director of the Academy, assisted by Hale P. Benton. Frank P. Fairbanks, a painter of great talent and with a well-rounded knowledge of all the arts, is at the head of the pat-on-the-back faculty, for here the students are supposed to work out by themselves all their problems in design and restorations, with perhaps a few encouragements by the higher-ups.

Dr. William Alciphron Boring is this year's visiting Professor of Fine Arts, and he brings from his position as head of the School of Architecture of Columbia University a leadership and a

personality quite unforgettable. He and I did a lot of roaming, during the process of which he made Baedecker look like a last year's edition of *Vogue*. We visited among other things *San Paolo Fuore Le Mura* with its flat ceiling, the largest in the world. What those modern trusses 100 feet wide must look like above that ceiling! There is, *maledictu*, quite a perceptible sag in the ceiling. Perhaps it is so rich that it can't stand alone. From a look-down-never-up point of view you can see your face in the highly polished floor,—that is, if you don't mind lying down on your stomach, right out there in church.

THE ORIGINAL HOUSEBOATS

Through the offices of the American Academy, the Director of Prehistoric Research of the *Collegio Romano*, a typical Fascist Italian, accompanied us to the spot where excavation work is now going on to lay bare the bones of the oldest ships extant,—the Barges of Caligula. They lie, two of them, in the mud of the *Lago de Nemi*, near Rome. One is entirely exposed; the other is still many meters below the mud. They seem to be some 230 feet long and 66 feet wide, built in the most massive way, all of heavy timber work, covered with lead and evidently of a highly ornate character.

The wood framework is all there today, but the marble floors and terraces are largely eaten away by the volcanic action of the mud and water.

These archæologists are draining the lake off into the ocean, many miles away, by means of old Roman tunnels and modern pipe lines. They have lowered the water level 20 or 30 feet already, but have to go farther in order to exhume the second caravel.

NIGHT CLUBS?

These prides of the sea were built more for comfort than for speed; in fact, they were noted for their lack of speed. They just sat there in front of the Emperor's palace and did nothing more strenuous than tug a bit at their moorings. They were undoubtedly meant for moonlight parties, but the archæologists think that the festivals held on board were strictly religious. We are strong for the archæologists, but they practically have no sense of humor. We believe that those parties were of the old be-around-and-eat-yourself-to-death variety, such as are described in "Messalina" and other toothsome volumes.

The bronze animal heads with rings in their mouths are beautifully modeled, in a perfect state of preservation and patina, and very recently they dug up a swell bronze stanchion with a double-headed top, two bearded gentlemen back to back, the uprights having three slots for the horizontal rails. The plumbers who read this will be glad to know that the excavators found lead pipes and bronze pipes with gate valves exactly as we have today, two thousand years afterwards.

It is strange to note that some painted iron straps were found perfectly preserved and in colors exactly those of the Fascisti of today. Locks and hinges and anchors and fish hooks just like our modern designs are being found, and they will probably exhume in a few days the fisherman's friend,—a demijohn of good old Bourbon.

THE GOOD OLD BICEPS DAYS

Those old Romans probably didn't need electricity at all. They had a lot of concealed slaves down in the bowels of the ships, working the pumps and the lights and cooking the food, and making the red wine, just as all the Italians in the United States are doing today.

The barges are going to be pulled up on dry land as soon as possible, and then the lake will be allowed to fill up again. It is a veritable punch bowl in effect, and the surface water runs into it from every possible direction, hundreds of feet down from the snow-capped mountains.

They are pursuing the work of excavating ruins with great fervor about Rome and in Pompeii. But I didn't see a steam shovel or a sucking dredge or anything else of that kind at work. All hand labor, and that seems to be the principle of the Mussolini government,—work for everybody, even though it has to be thinned out in the operation. All the hotels, all the ships, all seem to have an overabundance of employes, who must necessarily receive comparatively little in salaries and in their share of the service charge. For instance, my room in Rome, at a very good hotel, was only $2.60 a day. The service charge was 26 cents a day, and when that was divided up among the employes, from the *concierge* (who knew a great deal more than most college professors know) down to the six little bellboys hovering around, I should think they would rather have me stay away!

RISTORANTES AND *TRATTORIAS*

There is one amusing restaurant in Rome, installed in an old semi-circular domed basilica, the brick walls still as they were. It was something like dining on the stage of one of the new German theaters, with its half-sphere sky dome above.

After dinner the crowd descends a steep, gloomy staircase and seats itself in the crypt, to listen to a small stringed orchestra, one member of which sang a lot of amusing songs with, strangely enough, no American composition in the lot. The architectural restoration was not so good in the crypt, however, for the architect or the crypt-restorer or whoever he was made the bench around the walls 27 inches high instead of 18 inches, and all the patrons' knees get rubbed the wrong way.

EATEN BY THE YARD

Another restaurant is famous for the gestures which the *maestro* employs when he mixes up the

butter and cheese in the *fettucini* (or glorified spaghetti). He almost goes insane over each dish he mixes. I must say I admire his endurance. And his skill as well, for in 20 years he has not broken as much as one single strand,—no, not one! Then he serves it with a beaming smile and with the national gesture of Italy, which consists of the thumb and the forefinger of the left hand making a perfect circle, the other fingers standing straight up, like *asperges.*

If you can get in the habit of making this gesture incessantly, you can buy things much cheaper, for they will then think you are an Italian with perhaps a temporary loss of voice, and you ought to be able to pick off a few discounts.

They give you your money's worth on the wine, every time. At the regular restaurants patronized by the Romans, you get a man's size decanter of red or white for 25 cents, and you can't kick at that! It gives you a very nice, substantial glow at lunch time, thereby engendering a more friendly outlook on life, and at the same time clearing up that faltering feeling in the feet.

AN EYEFUL

I was privileged to see, during this brief passage through Italy, a most beautiful country house, or palace, through the courtesy of the owner. The Villa Madama is one of the most lovely and fascinating jewels of the Renaissance; that is, from an architectural standpoint. And the way it has been restored surpasseth all understanding. It seems to my more or less practiced eye to be perfect. And that's a good deal.

The Villa itself stands in a most lovely garden, replete and gleaming with old statues; with pools and with the most enchanting planting. The main hall or loggia, vaulted with lofty arches, has strong evidence of having been decorated by Raphael, or by some of his pupils at least. The decoration is delicate and of great beauty in color. No doubt it has been illustrated in some of the books, but not having seen it before, it left me panting with excitement.

The owner of the Villa, Count di Frasso, has lavished time and money and talent and learning in the restoration of the Villa. Porphyry from Egypt, bronze work from Austria, lapis-lazuli from some hamlet in Africa, with a stairway of travertine stone replete with good old family Doric columns and entablatures.

AND THE WATER RUNS

But going back for a moment to our favorite subject of plumbing, the bathroom of the *chatelaine* of the Villa is the most trick, the most chic, the most elaborate that I have ever seen. Never do I expect to bathe in one so magnificent. All I could do was just *look* at it.

Marble floors and walls, in all colors and shades; mirrors everywhere, with palms and tropical 'scapes painted on; a gorgeous ceiling; and there, sitting up on a dais, all by its Standard Sanitary self, was a red Numidian bath tub, hewn out of a solid block of marble. And mark this, all you master plumbers, not a pipe, not a faucet, not a pop-up waste, in sight. A close examination of the tub,—happily vacant at the time,—revealed a small escutcheon at the bottom. This was a *multum in parvo* come-and-go arrangement, however. A turn of a valve down behind the back of the tub turned on the hot water, ditto the cold, and a third let the water out.

The wash basin was also carved out of a solid piece of marble, and again were the faucets cunningly concealed. As for the other two fixtures in the bathroom (you know there is always an extra fixture in foreign lands), they beggar description. Entirely covered with wood, decorated in a Japanese gold and black lacquered design, they didn't look what they were at all. In fact I didn't know at first which was which or Who's Who in the bathroom. But then I'm slow at some things.

ONE WAY OF GETTING IN

On another day we strolled through the Villa Medici as far as visitors were allowed,—in the garden only. Seeing a card on a studio door, *Beaudouin Eugene, Architecte,* I boldly rapped and when the young *Prix de Rome* answered the door, I speedily introduced myself, mentioned the name of Whitney Warren (which is the open sesame to everything in Europe), and was received with outstretched arms. He took us all over the Villa, where, in the dining room, are portraits of every Prix de Rome man who ever went there. I recognized several old friends, Gounod, Massenet, DeBussy, Laloux and Charles Garnier.

The young Frenchman wants to come to America,—and so did every Italian I met. I learned to salute in the Fascisti manner, and learning that Mussolini does not let one with a record leave the country, I watched my step day and night,—especially night.

This little memoir of a hurried but delightful re-visit to Rome is not to be taken as a guide book. I will admit, however, that among the authorities consulted were:—

Carta di Ristorante Alfredo
Lista dei Vini, Compagnia Internazionale delle Carroze con Letti
Telephone Directory of Rome
Paris Edition of the *New York Herald*

If any of you readers go on an architectural jaunt to Rome, go first to the *Academia Americana* on the Janiculum Hill, fare 6 lire 50, shake hands with the boys, and let Nature take its course.

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CRITICISM OF THE CHRYSLER BUILDING

TO criticize the Chrysler Building from an architectural point of view is one thing, while to criticize it from an advertising point of view is a totally different matter. To criticize this great building from the point of view of contemporary commercial architectural design is of foremost interest to the profession as a whole. Legitimate, constructive criticism is always not only justifiable but beneficial, but in the case of the Chrysler Building architectural criticism is difficult because of the tremendous advertising feature involved in the problem of the design itself. Very much as Woolworth commissioned Cass Gilbert to design for him a building which would surpass in height and architectural interest anything previously conceived by man, so also did Chrysler commission William Van Alen to design and erect for him a building which would be not only the tallest in the world at the moment of completion but also one through the unusual design of which widespread comment and discussion would result. Although no colossal five and ten cent pieces form a feature of the tremendously ornate architectural decorations of the Woolworth Building, yet this gigantic Gothic tower will stand until demolished as a memorial to the brilliant and successful creator of the world-wide chain of five and ten cent stores. In his building for Mr. Chrysler, William Van Alen has gone Cass Gilbert one better in that the industry in which his client is an outstanding figure is conspicuously suggested by the colossal enlargements of the well known trade-mark of the Chrysler car. As already set forth in the foregoing description of this building by Eugene Clute, above the great black marble tomb-like entrance of the building on Lexington Avenue there is placed an enormous reproduction of the winged Chrysler radiator cap in non-corrosive metal.

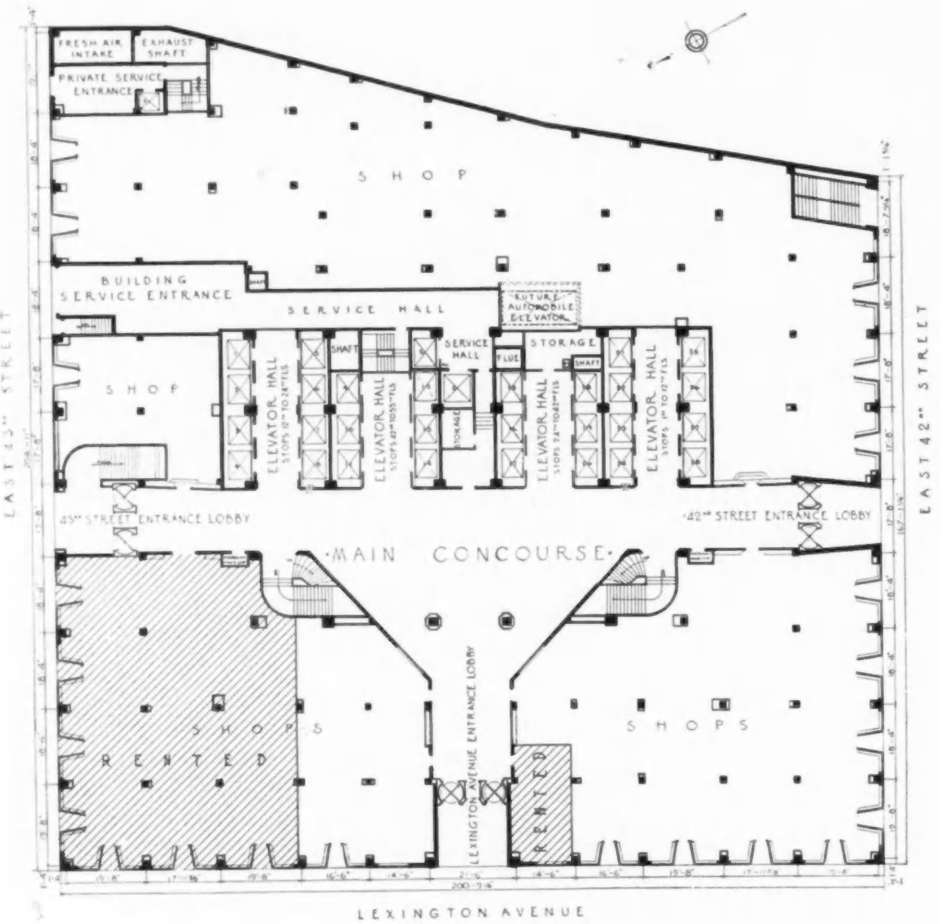
The same brilliant material has been used for the colossal eagle heads which project like huge gargoyles from the corners of the 61st story, and again in the four enormous corner ornaments at the 31st floor, again representing the Chrysler radiator cap. From the point of view of design these gigantic ornaments add little to the architectural quality of the building, but undeniably they add an advertising and a personal quality. Certainly, as the design of the building was undoubtedly conceived as an expression of a colossal tower, the building in its masses as a whole indicates a careful and successful study of scale and proportion. The main tower is well supported and flanked by the larger masses of the lower stories. The cleverly conceived and successfully executed quoin-like treatment of the corners of the main tower might have been repeated with equal success in the lower portions of the building, particularly below the first setback where the regular and uniform treatment of the fenestration is somewhat monotonous. A pleasing verticality has been achieved in the interesting treatment of the second setback, and a decorative effect, obtained by the clever use of black and white brick in the stories immediately below the tower, shows a great deal of originality and praiseworthy study. It is in the design of the great finial of the building that this quality of architectural design ends and fantastic imagination begins. Up to this point the Chrysler Building is a characteristic example of modern commercial architecture, a building built as a financial investment, a practical money-making proposition of so many floors of desirable rentable space. But above the 61st floor the personal element enters into the design, and we find a towering finial or elongated dome of fourteen stories projecting itself into the low hanging clouds above Manhattan Island. Possibly the seven lower stories of this colossal crowning feature may provide desirable office space of limited area, but certainly the seven or eight stories, termed as "dormers" in Mr. Clute's article, with their peculiar radiating triangular windows, could hardly have much rental value. Whether or not we like the design of this unusual finial treatment, its unusual character must be admitted. Certainly no time-honored precedent or hallowed architectural tradition suggested this tapering pile of superimposed elongated arched dormers, six in all, which mount up to support the lancet-like spindle which pierces the zenith above. So unusual, daring and original is this design of the top of the Chrysler Building that one is almost forced to admire it, sparkling in its dazzling sheath of polished chrome steel. Bizarre, fantastic and exotic, it grasps and holds at least for a moment the attention of the passerby below, as well as the amazed interest of the countryside and distant seafarers for miles around. No, the Chrysler Tower should not be criticized from the usual point of view of architectural design. It stands by itself, something apart and alone. It is simply the realization, the fulfillment in metal and masonry, of a one-man dream, a dream of such ambition and such magnitude as to defy the comprehension and the criticism of ordinary men or by ordinary standards.

THE CHRYSLER BUILDING

THE ARCHITEC-
TURAL FORUM
OCTOBER, 1930
PLATE - 97

Photo.
Wurts
Bros.

WILLIAM
VAN ALEN
ARCHITECT



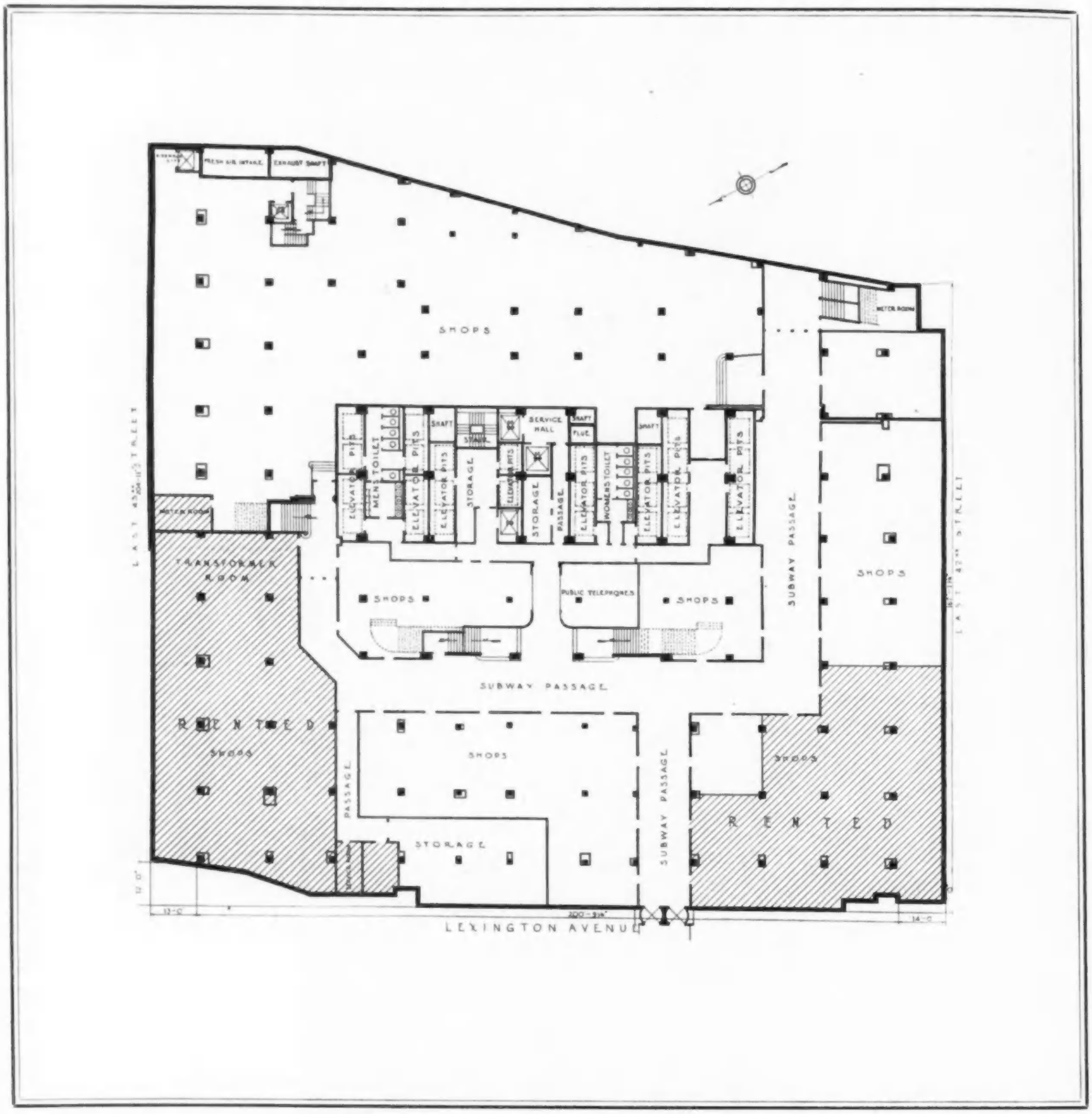
FIRST FLOOR PLAN

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

Photo. Eddowes Co.

FROM THE SOUTH

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT



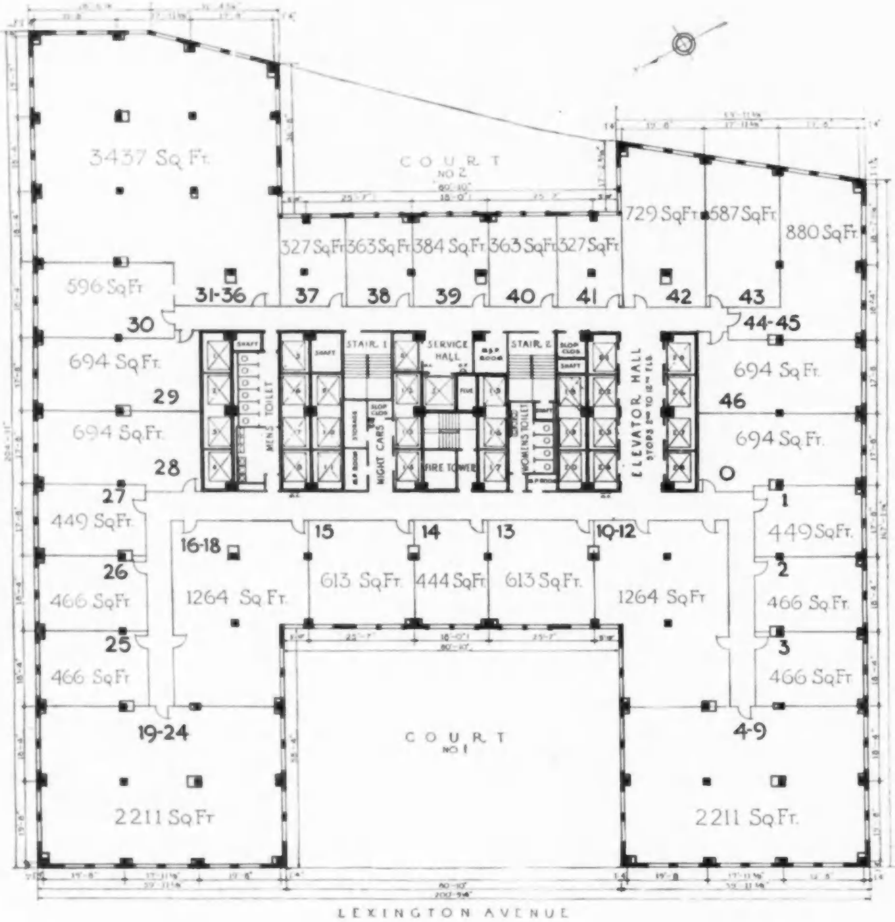
SUBWAY ARCADE, LOWER LEVEL

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

Photo. Nyholm & Lincoln

FROM THE EAST

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT



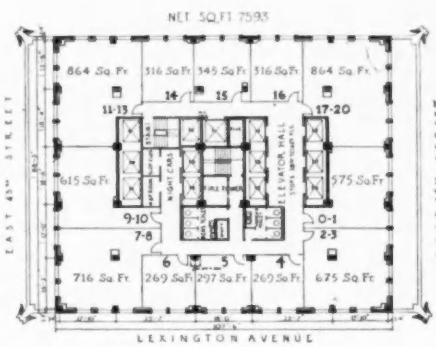
PLAN, 6TH TO 10TH FLOORS, DIVIDED

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

Photo. Sigurd Fischer

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

PLAN, 31ST TO 41ST FLOORS



PLAN, 31ST TO 41ST FLOORS DIVIDED

51ST TO 55TH FLOORS

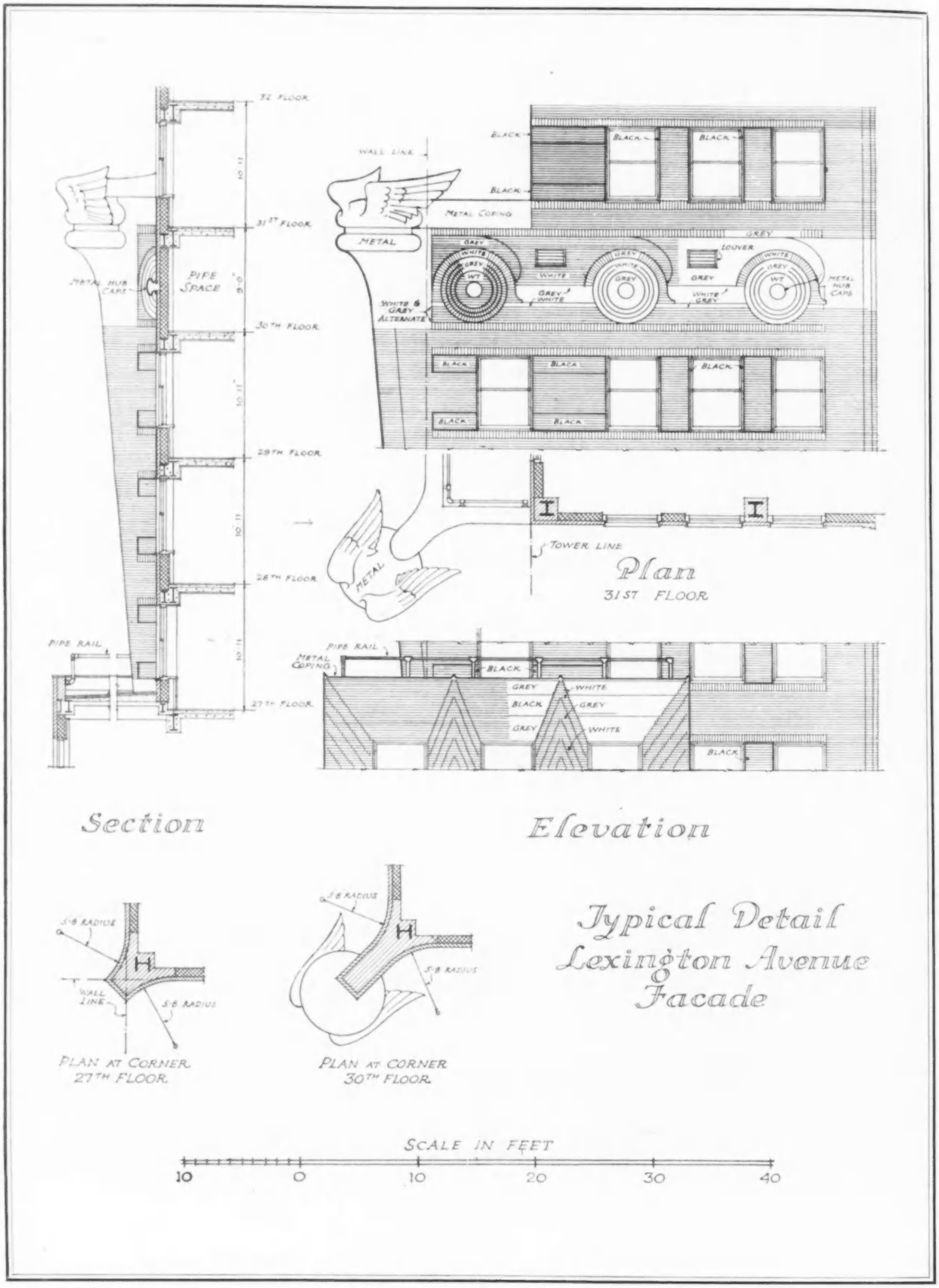
TOWER PLANS

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

Photo. Sigurd Fischer

DETAIL AT SETBACKS

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT



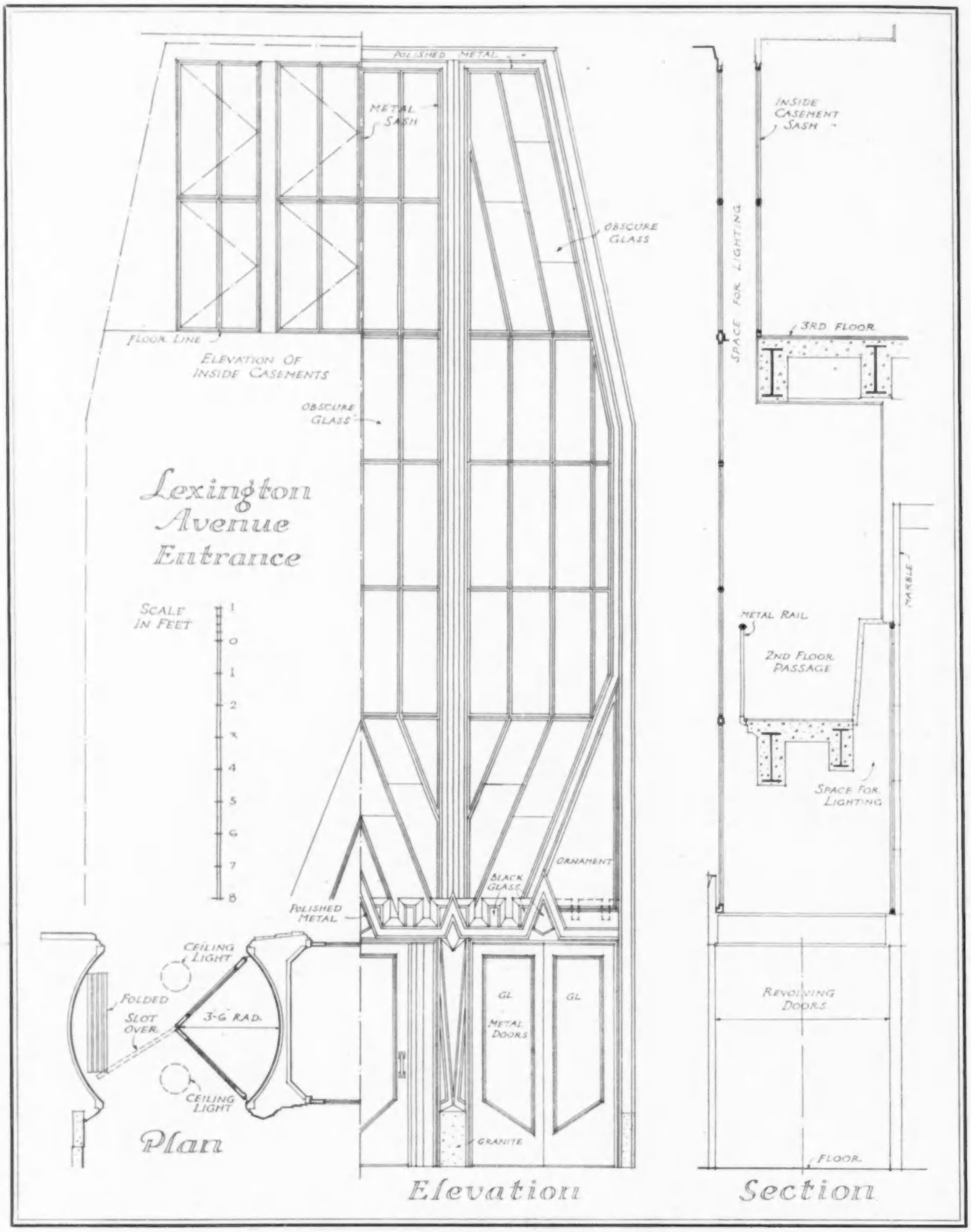
THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

Photo. Sigurd Fischer

42ND STREET ENTRANCE

THE CHRYSLER BUILDING

WILLIAM VAN ALEN, ARCHITECT



LEXINGTON AVENUE ENTRANCE DETAIL

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

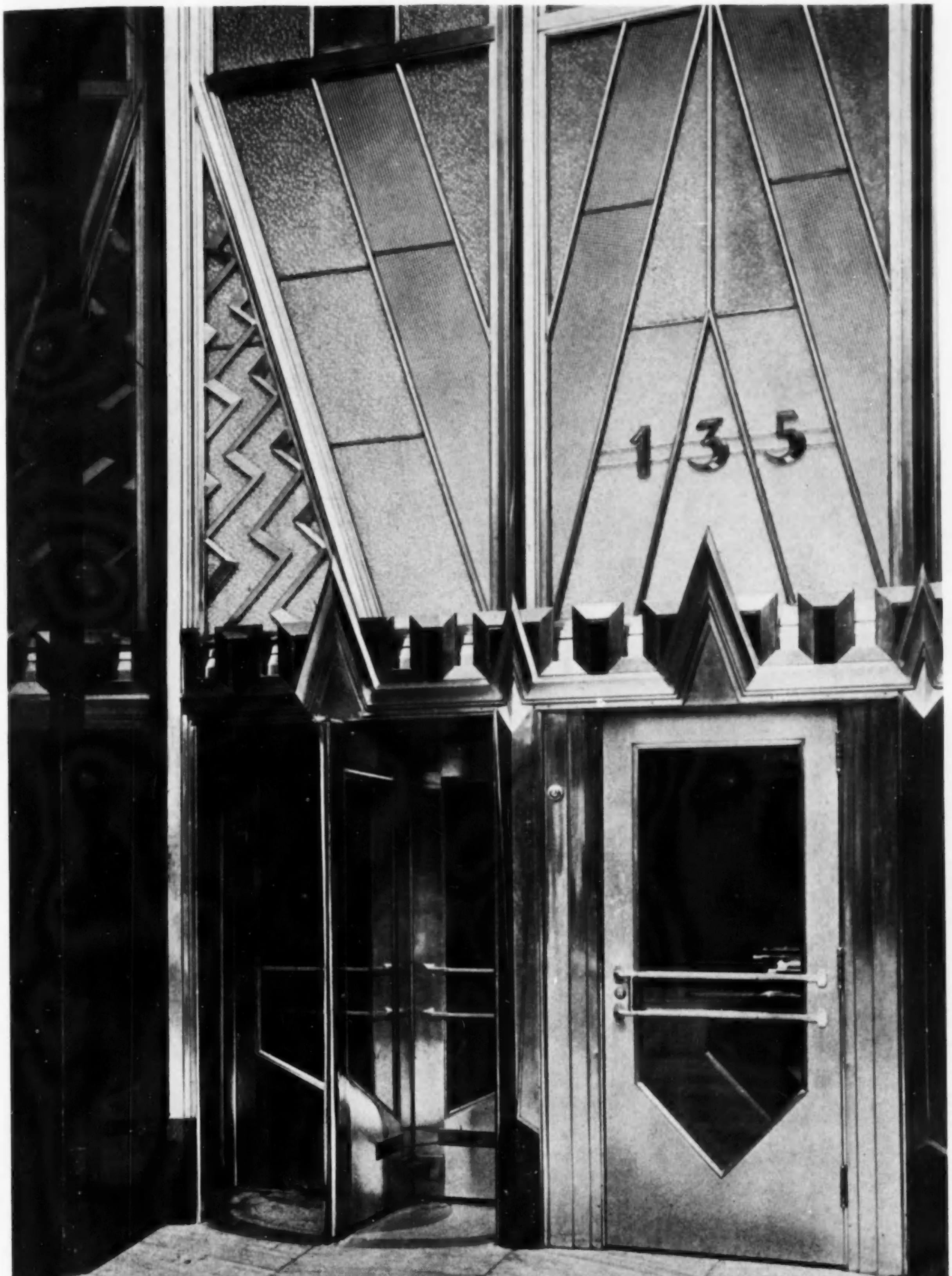


Photo. Sigurd Fischer

DETAIL OF ENTRANCE DOORS

THE CHRYSLER BUILDING

WILLIAM VAN ALEN, ARCHITECT

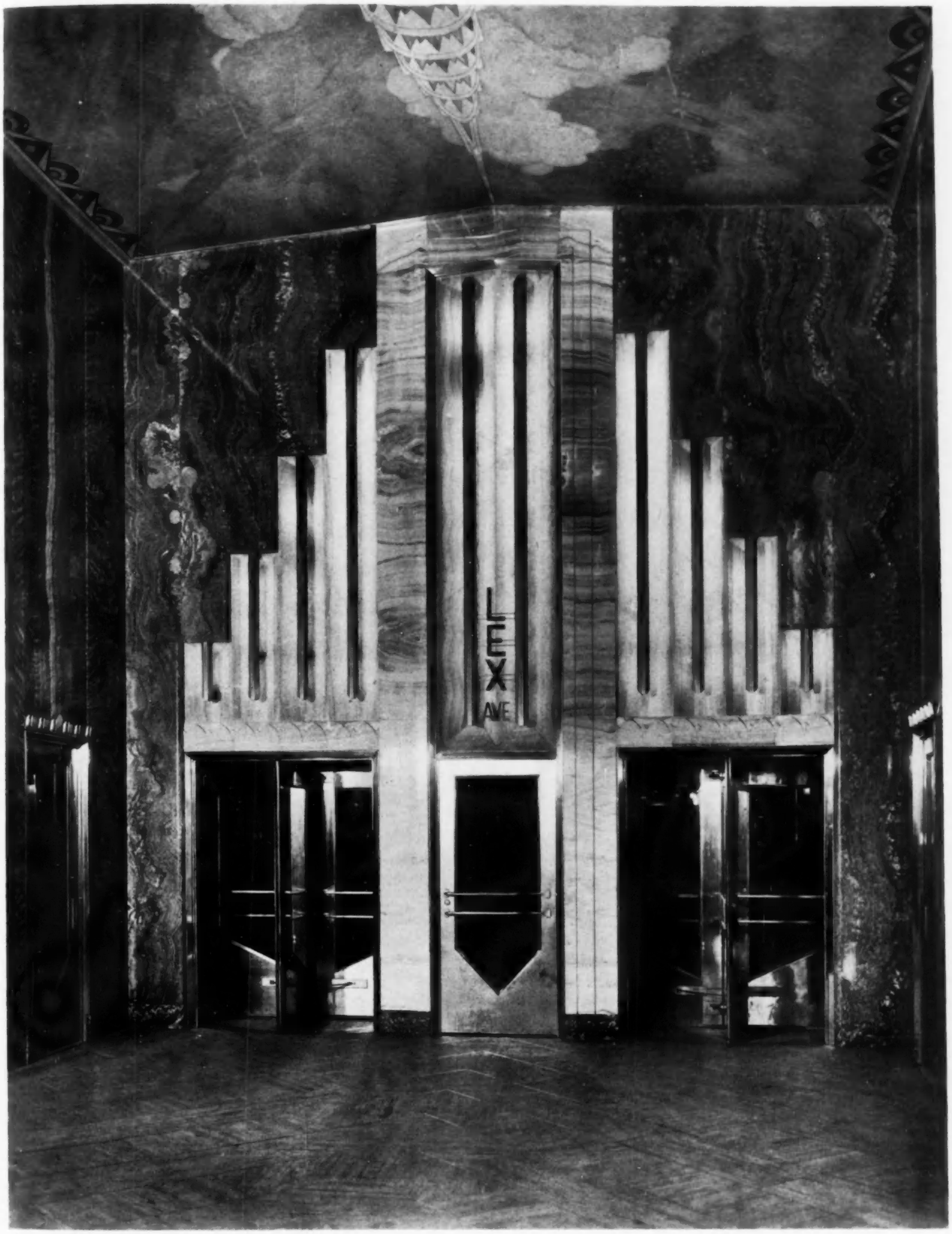


Photo. Nyholm & Lincoln

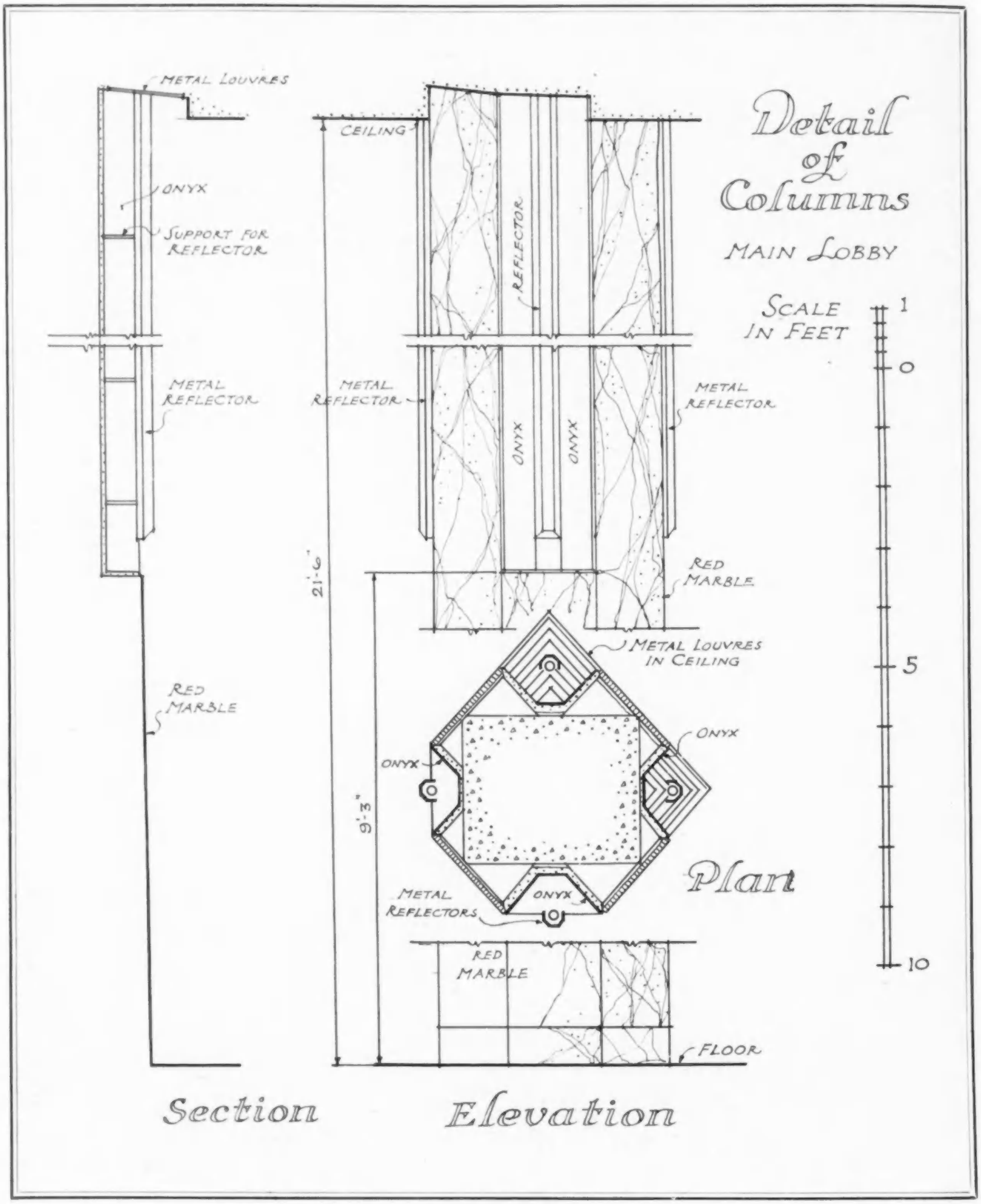
LEXINGTON AVENUE ENTRANCE

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

Photo. Nyholm & Lincoln

VIEW OF LOBBY LOOKING TOWARD ELEVATORS

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT



DETAIL OF COLUMNS, MAIN LOBBY

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

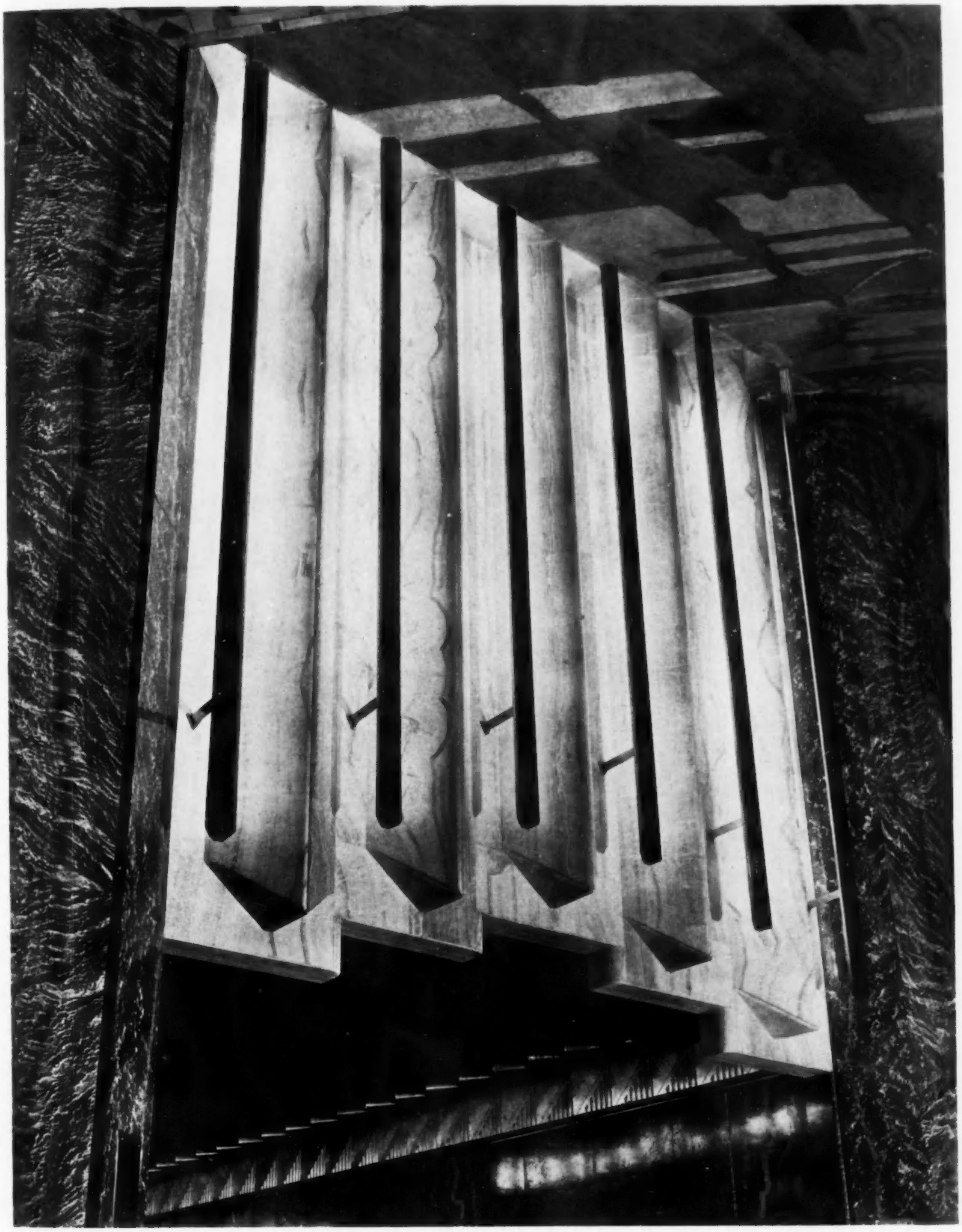


Photo. Nyholm & Lincoln

DETAIL OF LIGHTING, ELEVATOR LOBBY

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

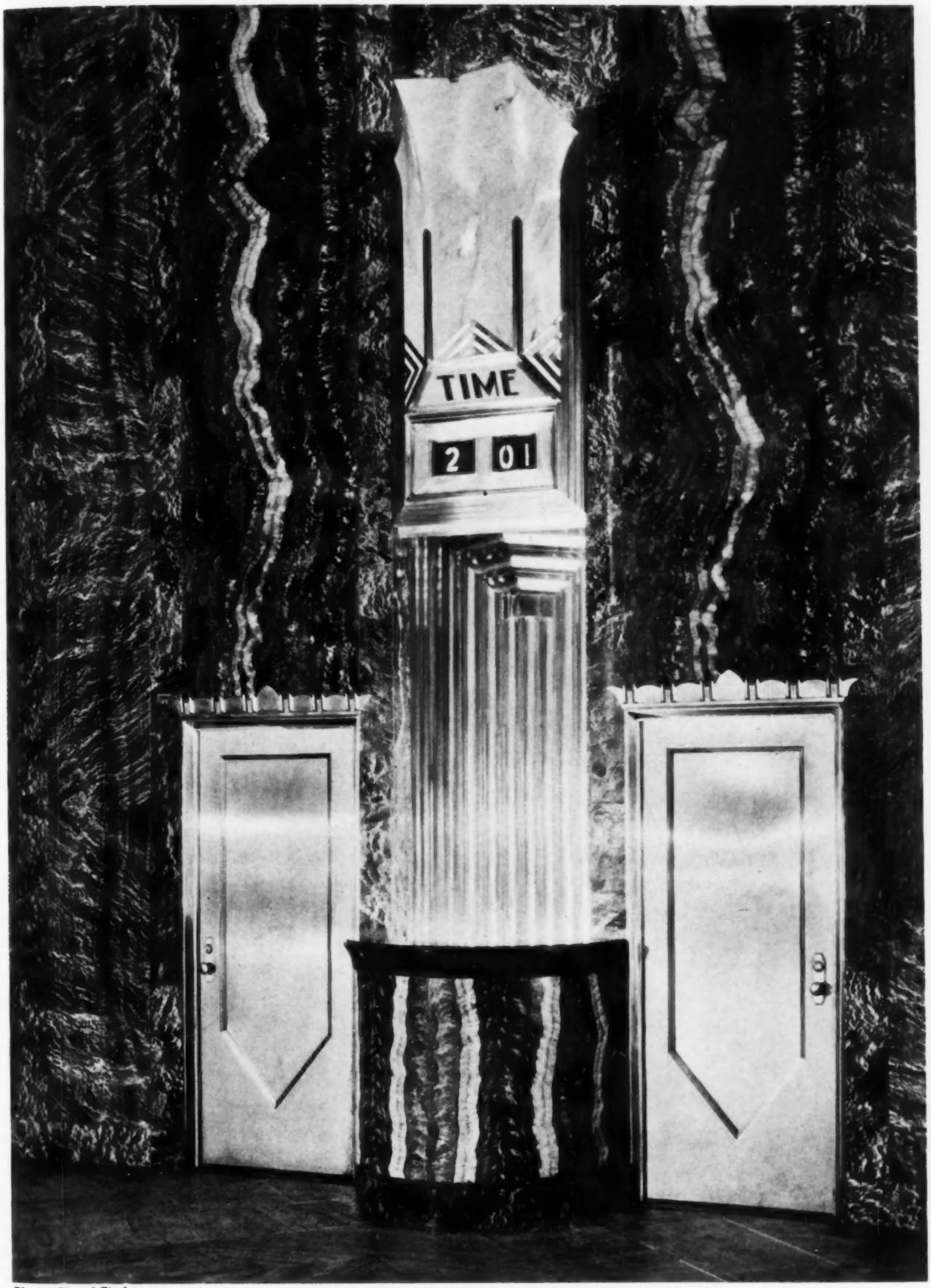


Photo. Sigurd Fischer

INFORMATION DESK IN MAIN LOBBY

THE CHRYSLER BUILDING

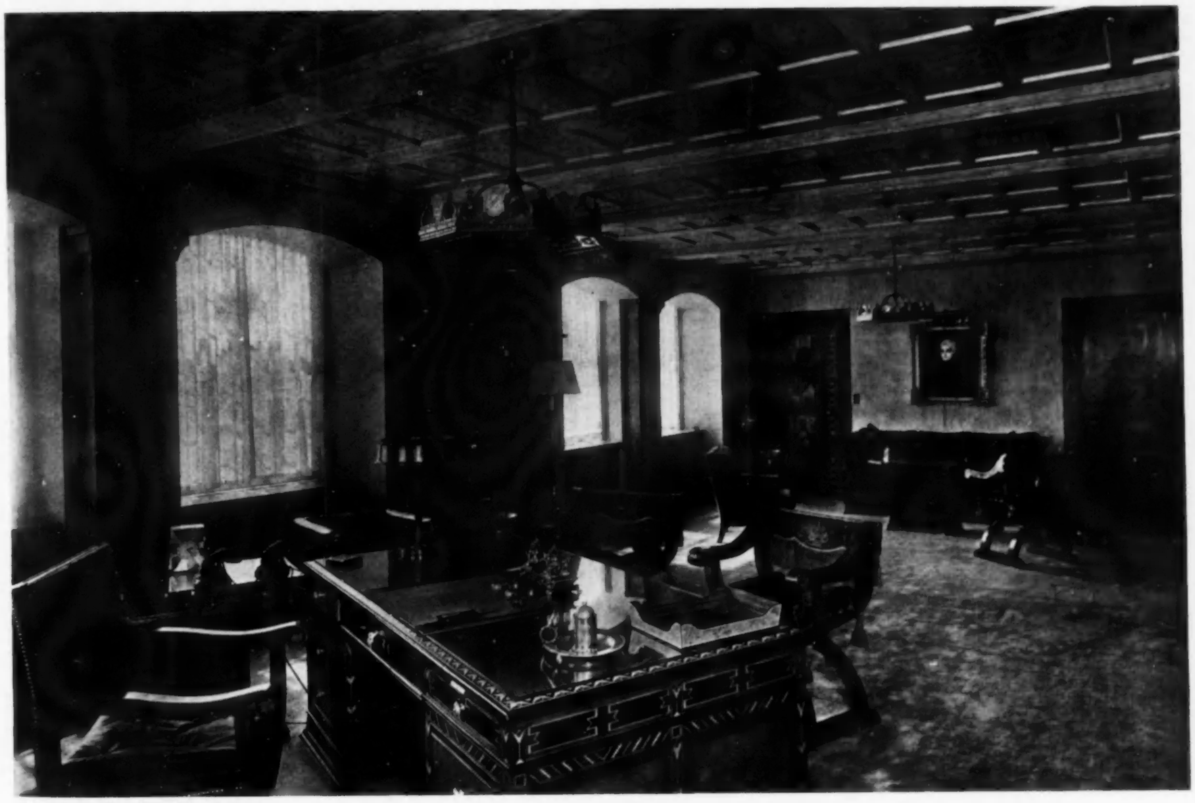
WILLIAM VAN ALEN, ARCHITECT

Photo. Sigurd Fischer

STAIR FROM LOBBY

THE CHRYSLER BUILDING

WILLIAM VAN ALEN, ARCHITECT



French & Co., Inc., Decorators

OFFICE OF WALTER P. CHRYSLER

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

French & Co., Inc. Decorators

OFFICE OF WALTER P. CHRYSLER

THE CHRYSLER BUILDING

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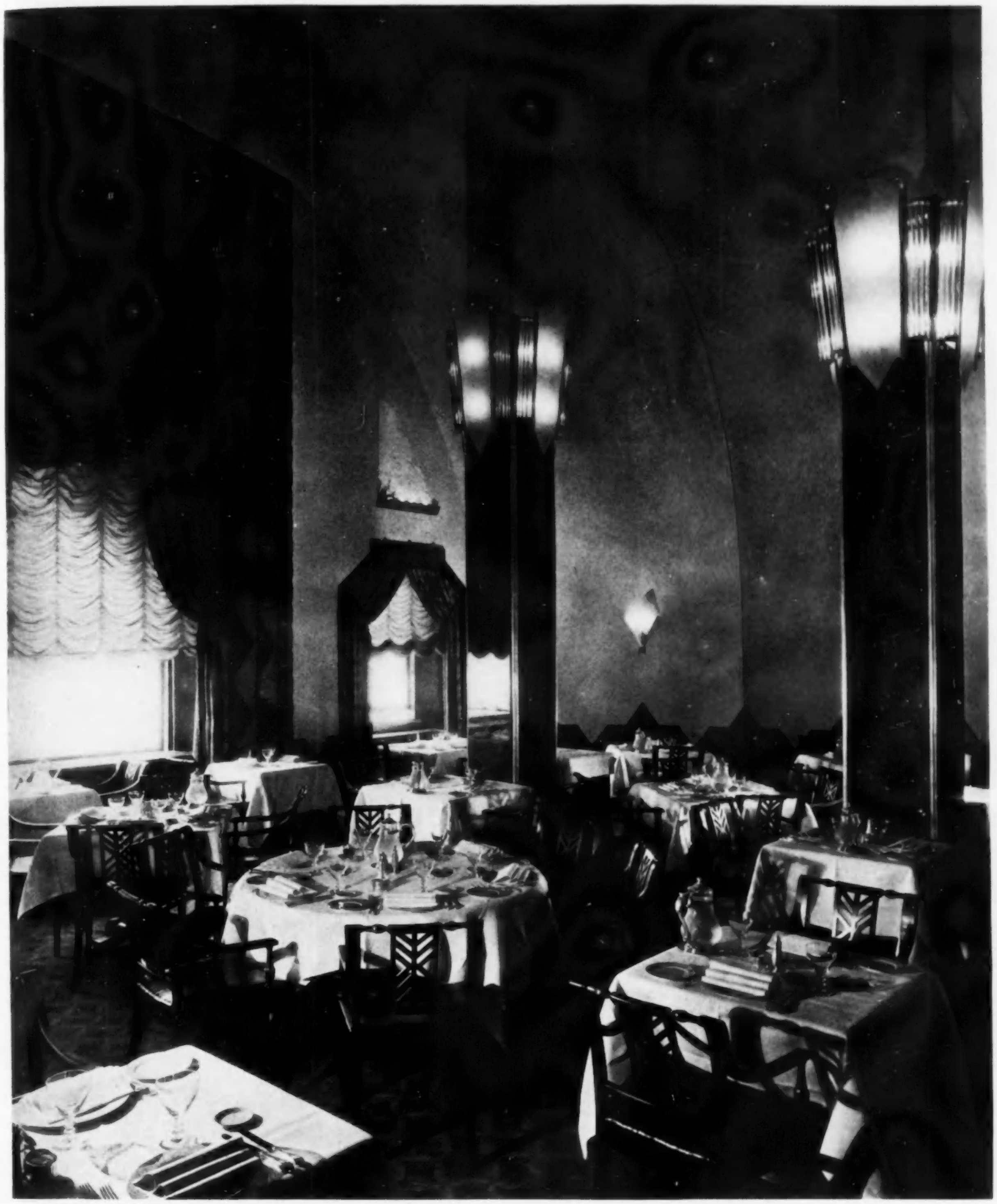


Photo. P. & A. Studios

DINING ROOM, THE CLOUD CLUB

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

Photos. P. & A. Studios

LOUNGE AND FOYER, THE CLOUD CLUB

THE CHRYSLER BUILDING
WILLIAM VAN ALEN, ARCHITECT

ON CLIENTS AND MEDUSAS

BY

ROYAL CORTISSOZ

MICHAEL ANGELO called Julius II his Medusa, and the figure was not inapt. The great tomb for the Pope, which passed through so many phases to survive only in the heroic fragment at San Pietro in Vincoli and the two famous "Captives," tormented the artist for something like 40 years. As Symonds says, it "empoisoned Michael Angelo's manhood, hampered his energy, and brought but small, if any, profit to his purse." A pretty thing for a client to do! But His Holiness is to be credited with a word in rebuttal. "He is terrible," he said of the master to Sebastiano del Piombo; "one cannot get on with him." That was in the sixteenth century. How do artists fare with their clients in the twentieth? Better, one gathers, but there are sometimes difficulties, having their origin, I imagine, in "temperament" on both sides.

It must have been so with Charles F. McKim and Pierpont Morgan. It is legendary that there used to be not infrequent "outbreaks" between those two when the library was building. They must have been quaint to witness, with a ruthlessly imperious client on one side and on the other an architect who not only knew what his design required but had a diplomatically adamantine way with him in getting it. But Morgan was truly magnificent, as Charles Moore, McKim's biographer, shows in more than one passage. There was the occasion when McKim was exhausted and, for once, despairing. "Mr. Morgan," he said, "I am worn out with work and concern. I must get a rest. Let me turn your library over to Stanford White. You have confidence in him." Like a flash the banker replied: "Go away and get your rest. When you go, work on the library will stop until you return. No one else shall touch it." I have never heard of anything in our architectural annals finer than that, finer in sympathy and understanding. Beautiful, too, is the story that Moore tells about the colloquy between them over the manner in which the walls were to be established. McKim had a deep ambition to build the library after the method of the ancient Greeks, but he knew that this would be expensive, with results not obvious to the casual beholder. Morgan asked him to explain. "When I have been in Athens," he said, "I have tried to insert the blade of my knife between the stones of the Erectheum, and have been unable to do it. I would like to follow their example, but it would cost a small fortune, and no one would see where the additional money went." All that his client asked was: "How much extra?" "Fifty thousand dollars," repliedMcKim. "Go ahead," said Morgan. It is a perfect instance of the only thing that will really hold artist and client together, a wise and in some sort a spiritual collaboration.

When trouble ensues it is usually, I believe, because the client forgets that the architect is an artist and is building a house as a painter would paint a portrait. We all know what the man of the brush has to expect when he has finished his canvas. The relatives of the sitter promptly ask him: "Isn't there something a little wrong about the mouth?" But at least he hasn't been interfered with while the work was in progress. It is

that edifying experience which occasionally causes the architect to see his client as Medusa, artlessly insisting upon structural changes of major significance and then recoiling from the consequent changes in the bill. She does this, too, I fear, not so much from the temperament to which I have referred as from sublime ignorance. If I were ruling the architectural world I would impose an inexorable law upon the profession. I would make it obligatory for every architect to point out to every client that he should send his wife to the drafting room every day for a fortnight or a month, for her to be instructed in the art of reading a plan. It is no doubt charming to deal with a woman who has chosen you as architect because she inordinately admires your work, but she will turn Medusa on you if she can't tell the difference, on paper, between a pantry cupboard and a dormer window.

On the other hand, the client who carries initiative and research too far is likely to prove the most egregious of all. It was Balzac who resolved to be his own architect, and when the roof was on *Les Jardies* there was no staircase in the house nor any provision for one! No, even a Balzac may crave too active a role. The ordinary client, dowered with the novelist's ego, would be a Medusa raised to a higher power. But Medusa enough is the client who flings his, or her, whole weight about, forgetful that the first element in collaboration consists in sensitively meeting the artist half way, comprehending him but not attempting to guide him, accompanying him on his task not only with penetrating sympathy but with a constant play of intelligence.

It is necessary to know that alterations spell enhanced costs. It is necessary to know likewise that they threaten the unity of a carefully considered design. It is necessary, above all, having chosen your architect, really to trust him, from beginning to end. Naturally this sometimes leads to disaster. I remember a house which was to be ready for the owner on his return from abroad with his family. They were to come and eat thei Christmas dinner under their new roof. Well, the came in, lit the fires,—and ate their Christma dinner at a hotel, their own chimneys havin smoked with a fury beyond all correction sav through weeks of reconstruction. Things happen like that, even to the best regulated architects. Nevertheless, I hold to my conviction that the only way to get a good house out of a good architect is to collaborate with him on terms of unshaken confidence. It is hopeless to regard him as a kind of caterer, and, when the walls are up, to put the gilded roof on the horror,—in Kipling's phrase,—by calling in an interior decorator.

I began with Pope Julius. Let me end with Isabella d'Este, that great lady of Mantua. She could be, in her moments, a formidable Medusa. When she wanted a painting from Perugino she insisted upon its being a *"fantasia"* of her own invention, and he, poor minion, with his art attuned to a devotional key, could only turn out the mediocre "Triumph of Chastity" which hangs in the Louvre today. But Isabella knew when to yield. Negotiating with Giovanni Bellini for the execution of a *"storia"* she had in mind, she swallowed like an angel his serene decision that he would paint according to his own idea. She wanted even then "something antique," which would have "a fine meaning," but he gave her a "Nativity" instead, and she was more than content. How she burned to help! She reserved a specific place for the picture, sending Bellini the measurements, and she kept the matter of lighting in mind. A grand client. Her traits would be more often matched in our own time if, regardless of temperament, a client knew more about architecture as an art, built a house not so much as a thing of convenience and display, to be bought and paid for, but more as a living organism, created out of experience and feeling. You don't "order" a house. You persuade an artist to evoke one for you. It must satisfy your needs, but it must express an artist's inspiration.

WEST BINSTEAD
ON THE PASSAMAQUODDY

A Village That Has Thus Far Escaped the Notice of Antiquarians

A COLLECTION OF
Material of Timely Import, Hitherto Unpublished Sketches, Historical Data, Notes, Annals and Legends, Oozing with Tradition

By
ANDREW SCOGGIN

IT is related in the annals of West Binstead that Jethro Bunker, sturdy Yorkshire yeoman, came sailing down Eggmoggin Reach one July morning just a year after the battle of Marston Moor. The Bunker family tree has had its roots firmly embedded in British soil since the time Eboracum was a fortified outpost of the Roman Empire,* Cn. Aurelius Bunkus (so named on account of his golden hair), being a centurion in Hadrian's army of occupation, while his great-grandson, Calvinus Dexter, was named *prætor* for the district of Flavia Cæsariensis by the Emperor Constantine.

Jethro was a grand-nephew of Adoniram Bunker, prebendary of Fountains Abbey near Ripon, and second cousin of Cecil Tetheridge, who, it will be remembered, was made banneret on the field by Charles I for gallant conduct at Edgehill. During the Civil War it was a toss-up whether the Bunkers would enlist under the royal or the parliamentary standard. Jethro's father, a staunch Presbyterian, who had served under Prince Rupert in Flanders, was strangely torn. He knew the horrors of war from actual experience, and realized the futility of civil strife, where brother was pitted against brother, father against son. Broken though he was in health and strength, due to the arduous rigors of his campaigns in the low countries, he determined to transfer the remnant of his depleted fortune to the New World and there start life anew.

The long sea voyage proved almost too great a tax for the old man. Head winds, alternating with periods of calm, delayed the gallant bark "Ariminta" far beyond the usual period. The crew suffered much from scurvy and were unable to splice the main brace which had become loosened during a severe electric storm which caught them unawares while the ship was in the doldrums. Jethro's oldest son, Lemuel, a mere lad of eight, used to tell in after years how he saw his grandfather high up in the mizzen cross-tree, the St. Elmo's lights casting a weird glow over his white hair, shouting down his orders to the terror stricken crew as they struggled valiantly with the recalcitrant stays. The ship was blown far off her course and the combined efforts of her crew and the sturdy Yorkshire passengers were required to save her. The electric storm affected her binnacle, and many weary days passed before the rock-bound crags of the New World were sighted.

OLDEST HOUSE IN WEST BINSTEAD · BUILT 1692.

Said to have been built by Peleg Gordon on the site of his cabin burnt by the Redskins under [illegible] on the night of June 4th

*Vide Wellbeloved's "Eboracum, or York under the Romans."

Third Presbyterian Church, West Binstead. Circa 1759

Space will not permit of a detailed account of the struggles of the early settlers of the Massachusetts Bay Colony; their persistence in spite of almost insuperable odds; their indomitable courage in the face of heart-breaking failures; their invincible spirit. It has been estimated that one out of every 20 of the early colonists fell a victim to the relentless fury of the pitiless redskins. It must be remembered, however, that the colonists were primarily the aggressors, that many deeds of cruelty and dastardly dealing were committed by the new-comers, and that intolerance was rife from the very beginning. In contrast to the treatment accorded the untutored savages by the French, that meted out by the English was black indeed.

The annals of West Binstead * relate how, some four or five years after the coming of the "Ariminta," Hephzibah Gordon, wife of Peleg Gordon, younger son of a Somersetshire preacher, was gathering whortle berries in the clearing, while her little daughter Priscilla, just able to toddle, picked the heather blossoms within earshot. Unconscious of time, newly come to the colony and unaware of its dangers, Hephzibah strayed farther than was her wont. Fortunately she was crouching beside a whortle berry bush when a savage appeared, only a score of paces away, atop a slight hillock. The story of her escape is still told from mother to daughter in the homes of West Binstead, as it teaches a moral no daughter should be without.

As long as she lived, Priscilla Gordon carried a scar on her chin where a random arrow, entering through a chink in the wall of the corn crib where they had taken refuge, grazed her ermine cheek as she lay crooning in her mother's arms.

Young Lemuel Bunker and his playmates grew to manhood in such surroundings, sturdy, fearless and skilled in woodcraft as well as in the

*"Proceedings of the Binstead Historical Society," edited by Amos Doolittle, printed by Ephraim Tuttle, 15a Charles Street, West Binstead, 1867, pp. 567, et f.f. op. cit., see Map opp. p. 594.

Masters' and Pilots' Club, West Binstead

arts of peace. He had a great reverence and affection for his grandfather and cherished his memory long after the old man had departed this life. The elder Bunker lived in Binstead long enough to see his family well established. He used to sit in the sun on the front stoop during mild weather, drinking home-made beer and nibbling Stilton cheese, shipped by packet and messenger direct from Melton Mowbray. On cold winter nights it was his custom to retire to the chimney corner, wearing his heavy felt slippers, grasping a steaming mug of hot Barbados rum and brown sugar in his gnarled hands. He would talk to his grandson for hours during these interludes and found the boy always an eager listener.

The first house Jethro Bunker built was a small cabin of logs, similar to Peleg Gordon's, but in a few years his growing family—he was three times married,—(a) Mehitable Judkins, (b) Serena Billings, (c) saucy Rebekkah Hartshorne, —made it imperative that he move into larger quarters. Accordingly the "Bunker Garrison," as it is still called, was built in 1669. (See Appendix A.) This is perhaps as fine an example of seventeenth century Colonial as may be found along the entire Atlantic seaboard. The exterior walls are of hewn logs trimmed to a uniform dimension of 10 x 10 inches with angles mortised and tenoned. For many years this form of construction was unsuspected; not until repairs were undertaken in 1884 on the west wall and a section of the clapboarding removed, were the logs revealed. Miles Bunker, the present owner, now in his 94th year, was surprised to find the marks of many Indian bullets, and even dug out several that had been embedded in the white oak timbers for at least 200 years. These cherished souvenirs may now be seen under a glass bell on the whatnot in the West Parlor. The great central chimney has ten fireplaces, those on the first floor being from 6 to 11 feet wide.

The First Presbyterian Meeting House was a one-story rectangular structure with a hip roof,

Old Brick Market, West Binstead, 1824

the walls built of hewn logs. This was destroyed by lightning at the time the settlement was attacked by the combined forces of the Passamaquoddys and the Amoskeags. The heroic behavior of the Reverend Joathim Bradbury in the struggle on the church steps, when, his body pierced by arrows, he gallantly rallied his terrified flock to the defense of the sacred edifice, is one of the most dramatic incidents in the early history of the town. Chief Maegumpsetunis, who was near the front door with his tomahawk poised above the head of Asa Doolittle, was struck full in the face. The "elements" played havoc with him; he seemed fairly to dissolve in a cloud of ill-smelling smoke. His charred remains were brushed up afterwards into a firkin and sent by messenger under flag of truce to Opottomawock, the Indian settlement on the Piscataqua, as a warning for infidels to keep away from Presbyterian Meeting Houses!

The Meeting House was burned to the ground, the fire having gained great headway before the dazed settlers could recover from the shock. Little is known of the Second Meeting House, 1684-1759, as at the latter date the structure was replaced by the present building in the provincial manner. As may be observed, parts of it are like the Old South Church in Boston, while it is also suggestive of Holden Chapel, Harvard University, insofar as a wooden building may be said to resemble a brick. The design is evidently inspired by Wren's church in Upper Tooting--unfortunately burned in George the Third's time—so this hypothesis may not be verified.* The Reverend Pelatiah Simpson Luce, D.D., has written a history of the Church (Bingham, 1819), but he throws little light on the matter save for the illuminating pages of the Parish Ledger.

The Historical Society recently took over the Old Perez Hammond House on Upper York Street (turn to the left as you pass the school) and, due to the generosity of Colonel Fullerton, completely furnished and restored it as nearly as may be to its original condition. It is related in the annals ** that the Elder Perez Hammond, who afterward married Zachariah Withee's sister Prudence, came to Binstead in the first decade of the eighteenth century and started in a modest way a coopering shop and rope walk. The shipping industry was then in its infancy and

Eliphalet Pine House

*Vide—"Fellow's Eighteenth Century Provincial Churches of the Passamaquoddy." ** Pp. 66 and ff.

Silas Blueberry Mansion, West Binstead, Abt. 1810

Perez, with the backing of a number of friends, built the baby barkentine "Bouncing Betty," the first, so far as is known, to come from a Passamaquoddy shipyard. On her maiden voyage she met and captured the "Jolly Roger." Short shrift was made of pirates in those days! While half the crew took bales of rare silks, seed pearls, copra and bags of doubloons from the hold of the "Jolly Roger," the others amused themselves taking pot-shots at "Black Jack" Wilberforce and his helpless crew, foaming at the mouth and cursing with rage on Octopus Key. The "Jolly Roger" was towed outside the 12-mile limit and scuttled. Wilberforce never recovered from the blow to his pride and was captured and hanged at Tyburn the very next spring.

Bunker "Garrison." 1669

When the "Bouncing Betty" returned to Binstead there was a grand public celebration. A hogshead of Santa Cruz rum was broached, and barrels of hard cider for the women, pans of hot doughnuts, steamed clams, lobster, blueberry pie and fried pollock were supplied in the utmost profusion. Speeches were made by Asa Doolittle, Ephraim Loomis, Asaph Trask, Ira Cannage and old Jethro Bunker. Perez Hammond, who had a pleasing baritone, sang "Sumer is icumin in, l hude cuccus isingin," and an exhibition of crewel work and samplers was held in the little red schoolhouse.

The outcome of this successful voyage was a notable stimulus to the shipbuilding industry. New yards were started, and the keels of three fine ships, the "Flying Dutchman," the "Sarah E. Prime," and the "Polly," were laid down. The "Masters' and Pilots' Club" was formed, afterwards incorporated under royal charter. The present building, long known under that name, on Lower York Street, was built from designs by John Smibert just after the French and Indian War. Like most of Smibert's work, it shows the influence of the elder Dance, distinguished architect of the Mansion House and St. Leonard's, Shoreditch, though in character it possesses all the refinements of the provincial period. In the "Masters' Room" there are portraits of four of the early "governors" of the corporation, painted by Kneller and his pupils. The Obed Talbot and the Peter Gill canvases are the best of these; unquestionably genuine Knellers.* The "Binnacle Room," on the third floor, is reached by a rope ladder and is said to be a reproduction of the Admiral's Mess on the "Thunderer." Elections to membership, which

*"Dictionary of New England Antiquities," Vol. XI.

is jealously guarded, are still held in this room, and at precisely eleven o'clock each morning the ceremony of "splicing the main brace" is performed. The annals of Binstead are silent regarding the Masters' and Pilots' Club; for the scanty information recorded we are indebted to "Fellow's Antiquities."

The Silas Blueberry Mansion in Upper York Street at the top of the hill is splendidly situated. It commands a view of Lobster Cove and far down Passamaquoddy Bay. It is an early Federal gem, three stories and basement, built of soft, light-colored brick, that has nevertheless, withstood the storms of 120 winters. Built by Silas (Blueberry) Jones, retired sea captain, owner and commander of the barque "Blueberry," from the proceeds of two score successful ventures in the East India trade, it has always been dubbed the "Blueberry Mansion." * Even to this day there is near the house a large blueberry patch which was the special pride of old Silas. Every year a section of the broad acres is bedded down with dried marsh grass and burned over in March. Different portions in rotation are thus treated, with the result that the finest berries in all Binstead, as large as cherries, are gathered all summer long. The "Mansion's" blueberry cordial and blueberry pies are famous through the Passamaquoddy region. The cordial is especially good. The West Parlor is as fine an example of Chinese Chippendale as may be found, though the furniture, unfortunately, is not in keeping with the elegance of the room. It is mostly of the only too familiar "Early What-have-you Period."

The Eliphalet Pine house nearby, on careful examination, will be admired for its pleasing proportions. The pilasters at either end are almost pure Adam with a hint of Charles Percier at his best in the necking of pine cones and crossed sprays of needles. There is a splendid old Hepplewhite *"Chaise-percee"* in the upper right hand room; the present owner, Miss Miranda Plummer, great-grandniece of Eliphalet Pine, has refused an offer of $1,200 for it.

* "Annals," Vol. IX, pp. 87-89, 102-116.

APPENDIX A

The garrison houses, of which a number still exist along the Kennebec, the Androscoggin and the Passamaquoddy, replaced the early villages surrounded with high palings. They served equally for defense, in case of organized attack by bands of marauding Indians, and for living quarters. Strongly built of squared logs, at a moment's notice they could be made well-nigh impregnable. One such structure, strategically located, served as a haven of refuge for a number of families. With bins of vegetables in the cellar, swinging shelves over the stairs loaded with mince pies, hogsheads of beer, a quintal of Barbados rum, barrels of salt pork, the attic loaded with corn, the rafters festooned with dried apples, and a well under the kitchen, the inmates could stand a protracted siege, grinning defiance at their baffled aggressors. After the first hundred years the Indians became discouraged and gradually withdrew into the fastnesses of the swamps and mountains where a tattered remnant of one hundred powerful tribes still maintains a primitive stone-age culture. The garrison houses were too well built to be abandoned when there was no longer need for them, so they were slighly altered and remodeled to fit new conditions. Larger windows were installed, the walls were clapboarded on the exterior and plastered on the interior, and even ornamental mouldings were added. Today only the antiquary may distinguish one from the later types.

Many other buildings might readily be singled out for special mention, but enough has been shown, we trust, to stimulate an interest in this little known but intensely (to the antiquary at least) interesting village. A visit to the rooms of the Historical Society will doubtless uncover much that has been hidden in the ruck and dust of by-gone decades.

LORING HALL

OF THE

AMERICAN SCHOOL OF CLASSICAL STUDIES, ATHENS

BY

JOHN V. VAN PELT

THE American School of Classical Studies in Athens is the Mecca for young American archæologists. It is a center for the study of ancient Greek lore. To it come enthusiastic delvers into the past, and from it there have gone out, in succession, those Americans whose names have become famous because of their ability to scatter the mists that veil the outlines of the greatest period of early civilization. Some 50 American universities and colleges contribute to its support. It gives training in archæology to resident students and fellows of these schools, and directs excavations.

An architectural fellowship is maintained there, usually filled by the prominent schools of architecture,—Columbia, the Massachusetts Institute of Technology, Harvard, Princeton. Indeed, it seems a pity that there are not more such fellowships. The refining influence of Greek art would be a healthful sedative for some of our less sensitive modernists, and Athens lies in the center of an area dotted with beautiful examples of Byzantine, while Asia Minor, Constantinople, Egypt, Sicily and the shores that line the Adriatic are on the perimeter of its field.

Five years ago Dr. Joannes Gennadius gave the books and original manuscripts on Greek matters, collected through long years of patient effort by his father and himself, to the American School of Classical Studies in Athens on the condition that a suitable building be erected to house the collection. Edward Capps, formerly minister to Greece and, when the proposal came, chairman of the managing committee of the School, presented the matter to the Carnegie Corporation. Elihu Root, one of the members of the Carnegie board, and Dr. Pritchett, its president, were awake to the possibilities for the development of American culture that would result from such a stimulant, and the Corporation appropriated funds for the erection of the Gennadeion Library group. It consists of the library proper and two little houses, residences for the librarian and a visiting professor. The small buildings are connected with the library by Ionic colonnades. A beautiful site for the building was donated to the School by the Greek government. It is situated at the end of Howe Street (named for the American who did so much for Greece during her war of emancipation), and, on the flank of Licabettus, will have the dark foliage of a national park as its background. It is separated from the old school buildings only by a minor cross street. The architects were John V. Van Pelt and W. Stuart Thompson.

Before the Gennadeion was thought of, a group of women, many of them presidents, or professors of archæology, history, and Greek in women's colleges, formed a committee to build a women's building or residence hall for the School. They purchased a piece of land that was opposite the School and lay next to the site that

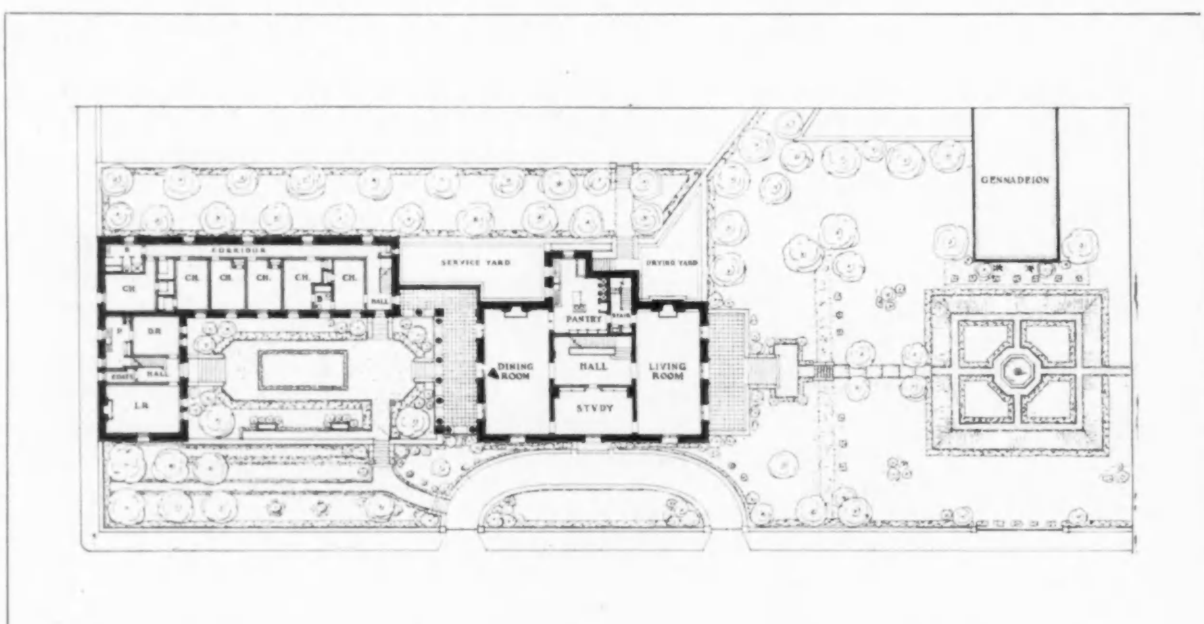
Forecourt and Colonnade

View from the Road

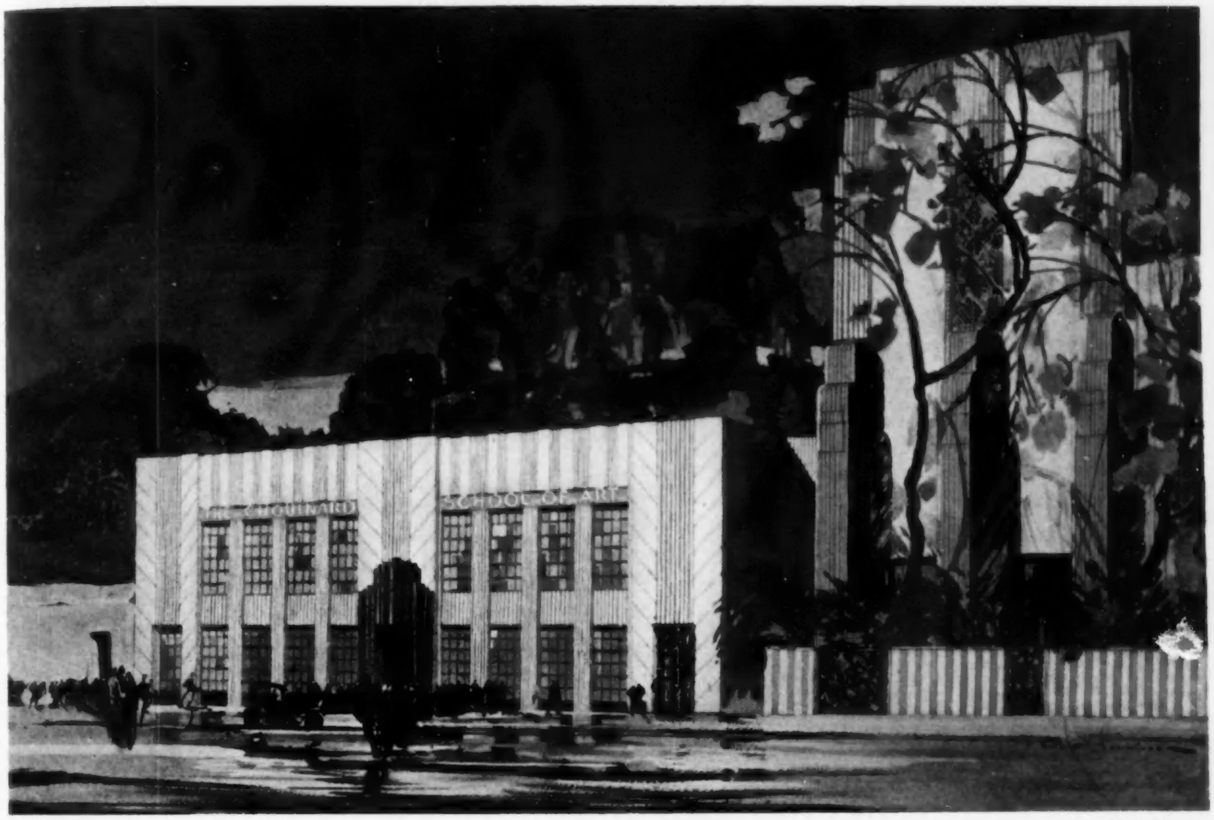
was to become that of the Gennadeion. The architects for the building then contemplated were those of the Gennadeion, the names being amended later to John V. Van Pelt and Thompson & Churchill, associated, but the fulfillment of the project was slow and passed through several changes of committee, until about three years ago, when the Rockefeller Foundation agreed to advance the major part of the funds needed on the condition that the balance be raised by others. Judge William Caleb Loring of Boston, for years one of the School's most helpful friends and president of its board of trustees, was one of the principal contributors to the fund needed.

The possible uses of the building were enlarged, and it became a general residential group to house and feed both men and women. It is planned in three units. The main division contains living rooms, the dining room, kitchens, and service quarters, with nine bedrooms, on the upper floor. The group faces south, overlooking Athens. The main reception room is on the east with a terrace affording a view of the Gennadeion gardens in the foreground and the slopes of Hymettus in the distance. The dining room is on the west end of this unit and opens on a porch and another garden, on the north side of which is a wing with two upper floors of rooms. At the end of the garden is a small residence for a visiting professor or assistant director.

The new building has been named William Caleb Loring Hall. Providing a home for American students in a foreign land and offering its shelter to visitors to the School, its hospitable walls will remain a memorial to the generous spirit that for many years gave counsel and wise guidance to the institution of learning of which it has become a part.



Loring Hall, American School of Classical Studies, Athens.
John V. Van Pelt; Thompson & Churchill, Associated, Architects



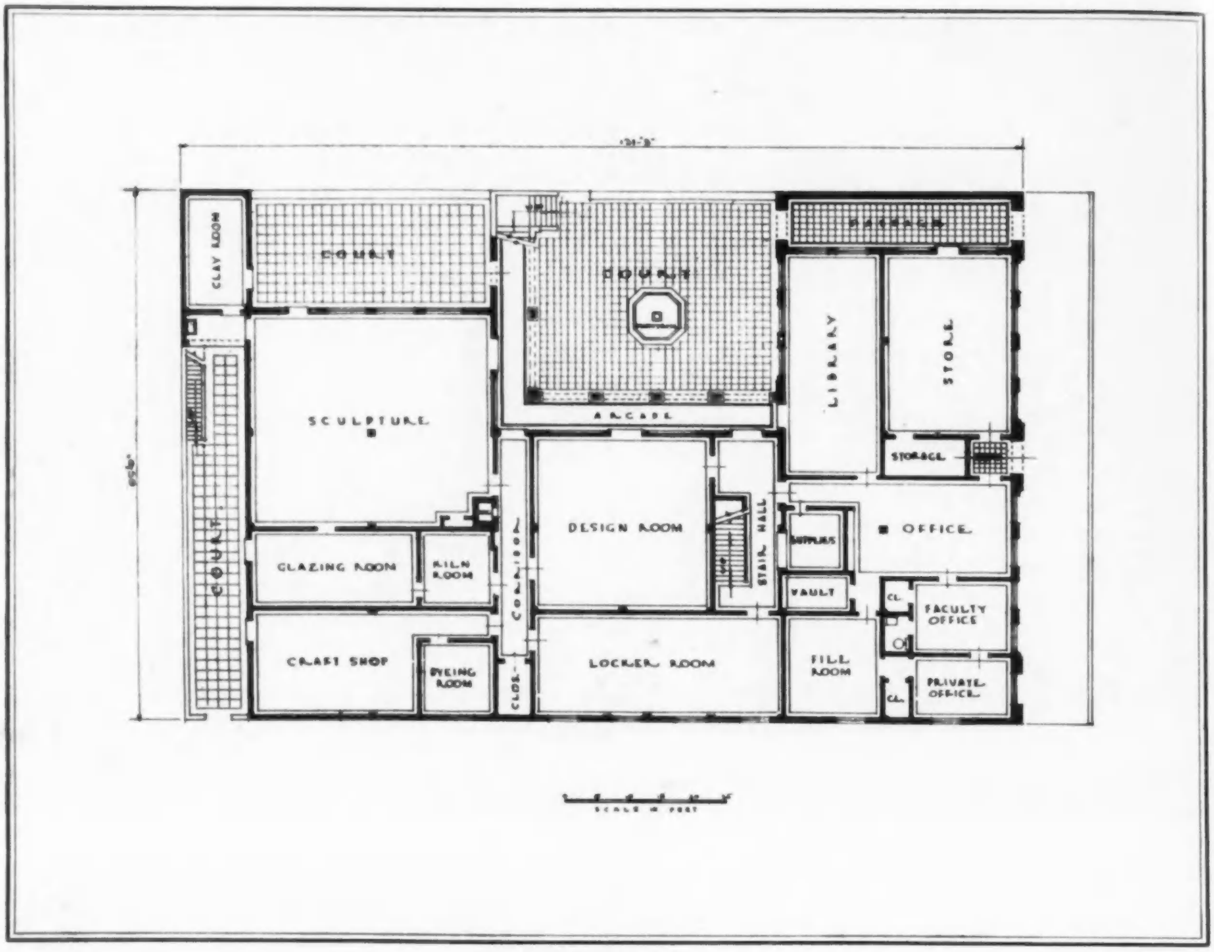
Mott Studios

PERSPECTIVE

THE CHOUINARD SCHOOL OF ART LOS ANGELES, CAL.

MORGAN, WALLS & CLEMENTS
ARCHITECTS

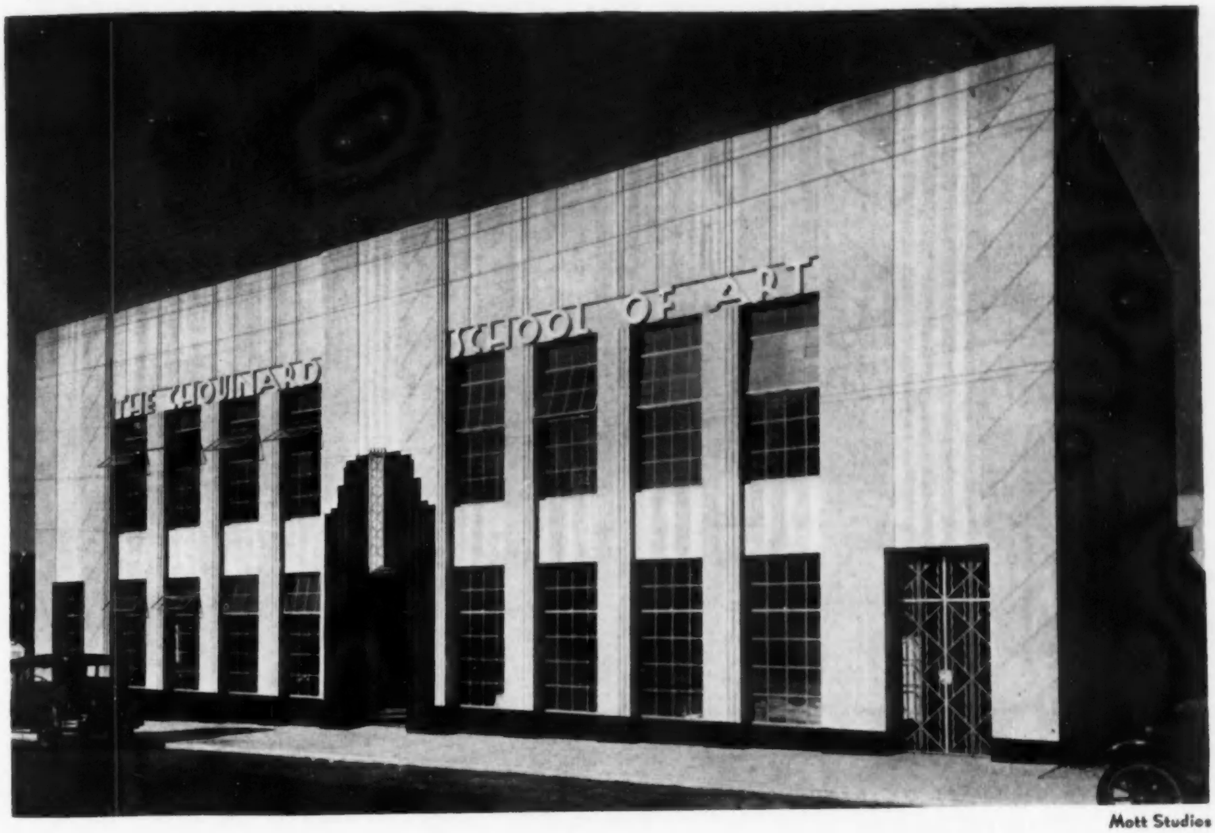
ENTRANCE



FIRST FLOOR PLAN

THE CHOUINARD
SCHOOL OF ART
LOS ANGELES, CAL.

MORGAN, WALLS & CLEMENTS
ARCHITECTS

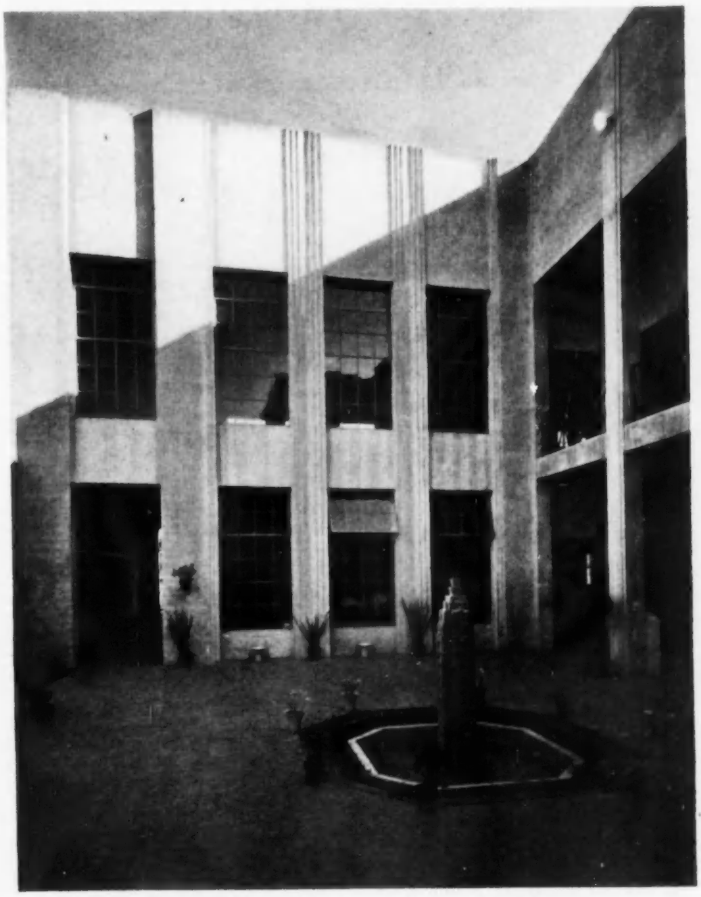


Mott Studios

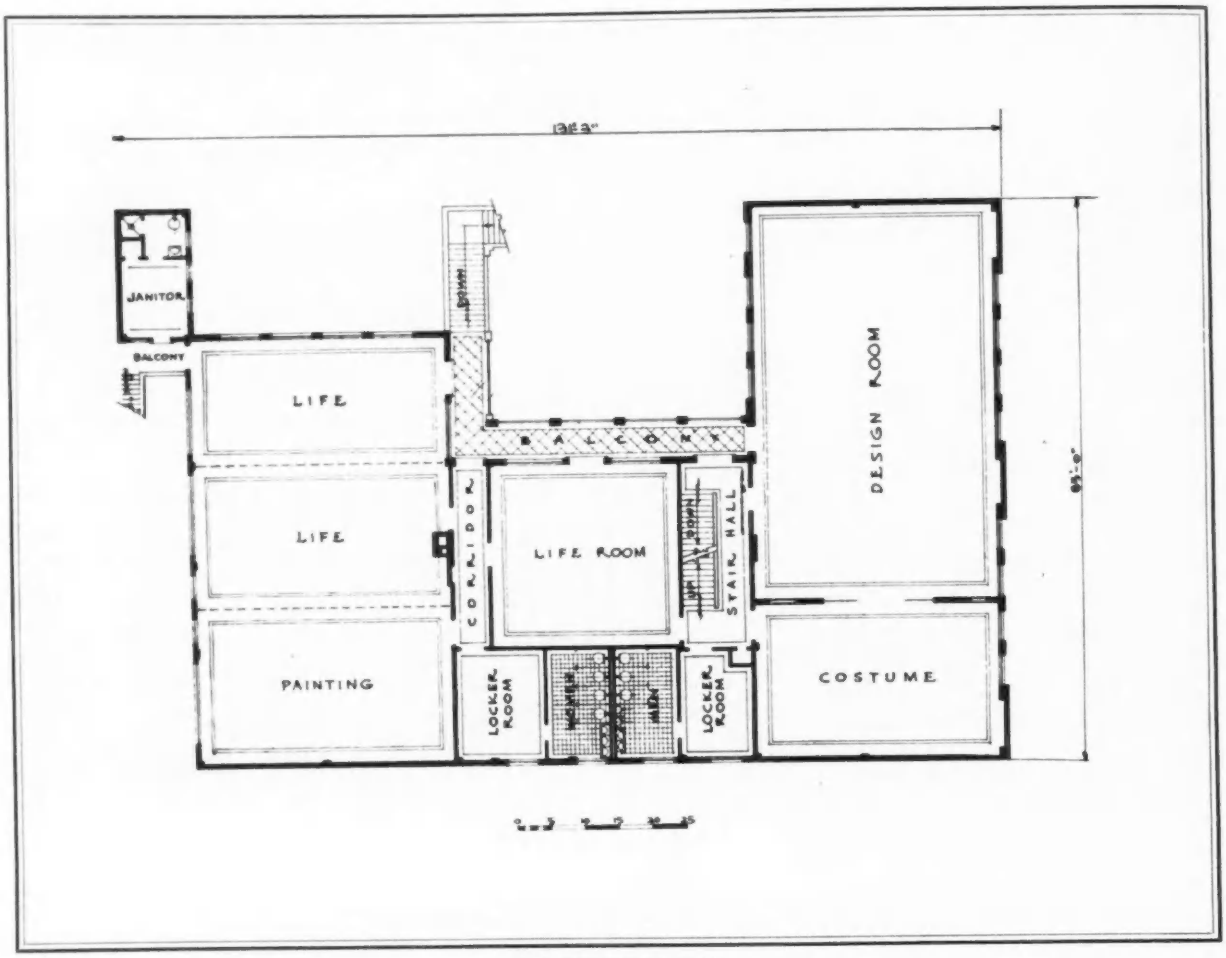
STREET FRONT

THE CHOUINARD
SCHOOL OF ART
LOS ANGELES, CAL.

MORGAN, WALLS & CLEMENTS
ARCHITECTS



COURT



SECOND FLOOR PLAN

THE CHOUINARD
SCHOOL OF ART
LOS ANGELES, CAL.

MORGAN, WALLS & CLEMENTS
ARCHITECTS

INTERIORS. THE CHOUINARD SCHOOL OF ART, LOS ANGELES, CAL.

Mott Studios

MORGAN, WALLS & CLEMENTS, ARCHITECTS

CRITICISM

IN the design of the new building for the Chouinard School of Art in Los Angeles, the architects have successfully incorporated many of the principal characteristics of contemporary architectural design,—the careful grouping of fenestration and the use of broad, simply decorated wall surfaces. The adaptation of the details of the design to the material,—exposed concrete,—is especially interesting and successful. The mass and the relation of the various parts of the design as a whole are excellent. The black marble base course is a practical as well as a decorative feature. The building is consistently simple in its treatment throughout, both in its exterior and interior design. This is fitting for a school of art in which the tendency to stimulate decorative freedom is maintained.

The design of the black marble entrance, while striking and placing emphasis where emphasis should be, lacks that quality of *architecture raisonné* which is characteristic of the rest of the building. It seems a *tour de force* in the modern vernacular, as it is lacking in structural quality.

The plan has several novel features, one of which is the outdoor court which is used, at times, as a studio for the life class. There is also a store, which is maintained for the sale of student work in an effort to provide practical experience and to encourage the competitive spirit. The interior court may have a certain charm of its own, but it is not the grace and beauty of the usual court yards of the Italian or Spanish palace, where the form and decoration make the most of sunlight, shade and reflected light. There is an almost industrial brusqueness and severity about the design of this building, both on the exterior and interior, which is probably conducive to originality in the designs of the art students, but which certainly was not intended to inspire that sense of beauty which is found in traditional art.

FIRST PRESBYTERIAN CHURCH
GREENSBORO, N. C.

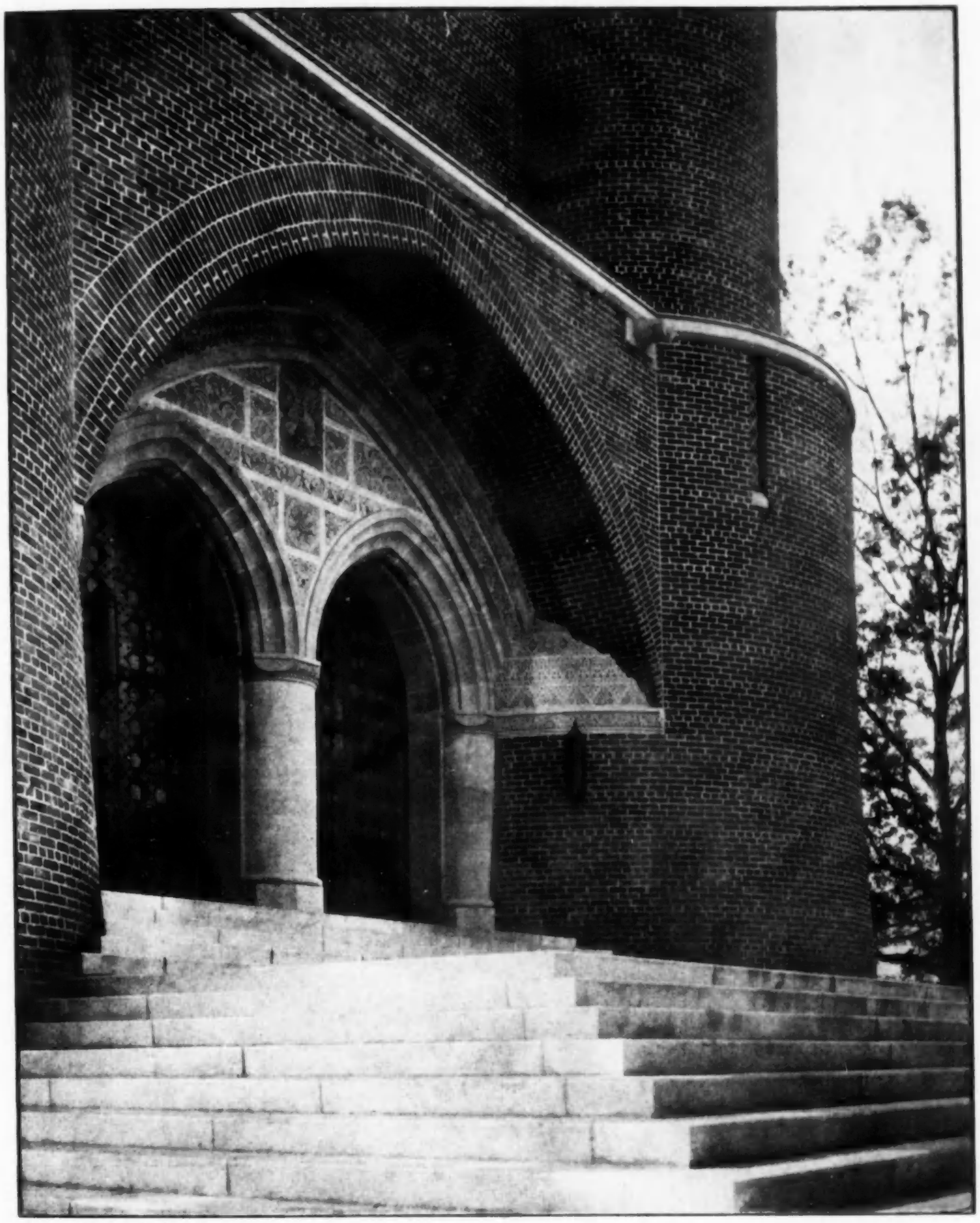
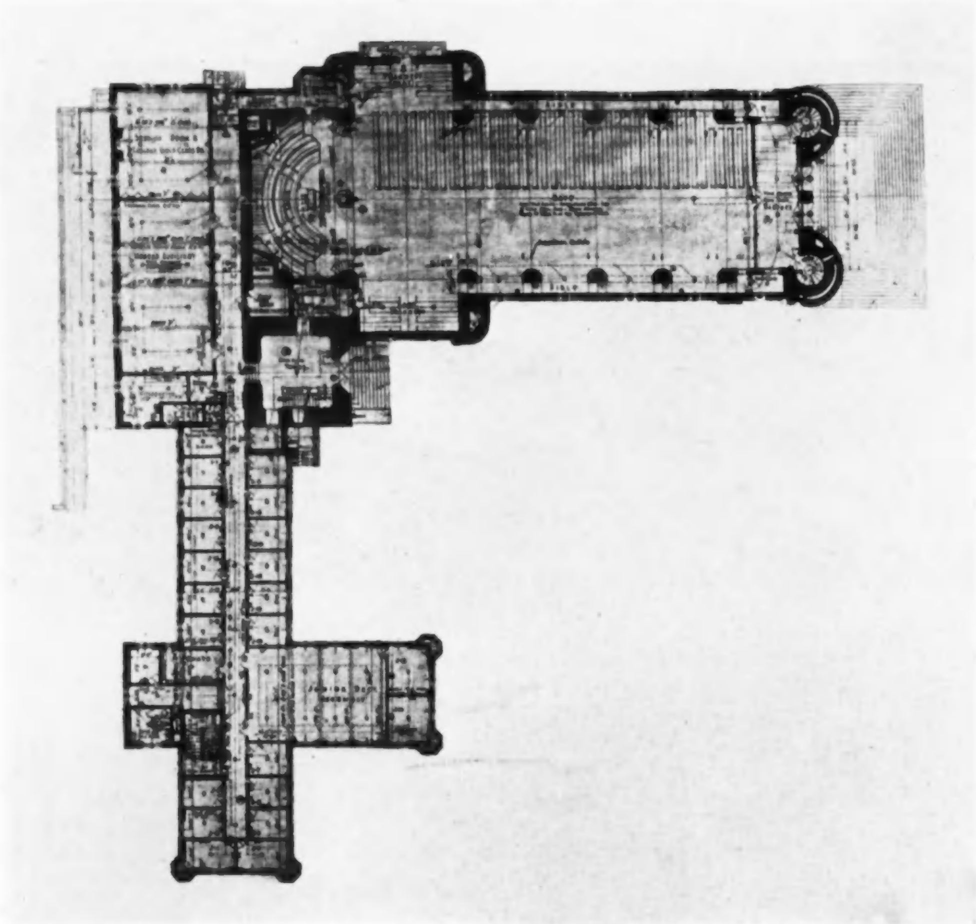


Photo. Tebbs & Knell, Inc.

MAIN PORTALS

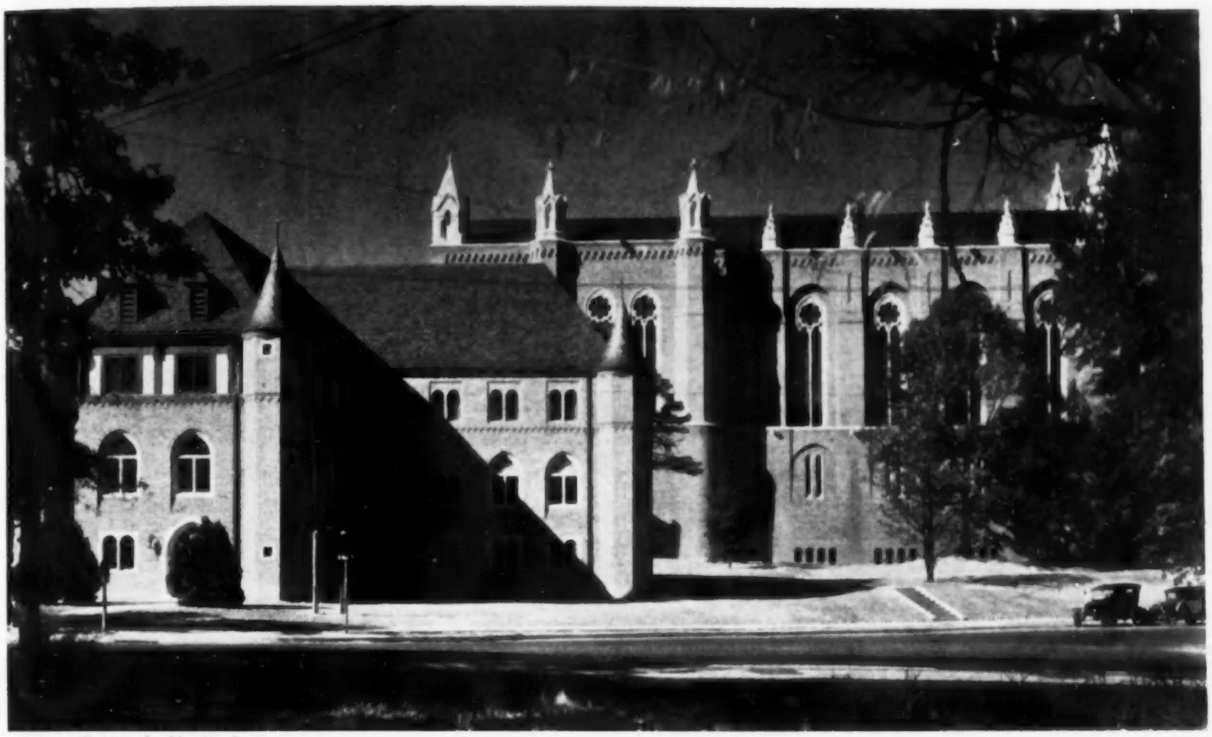
HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT



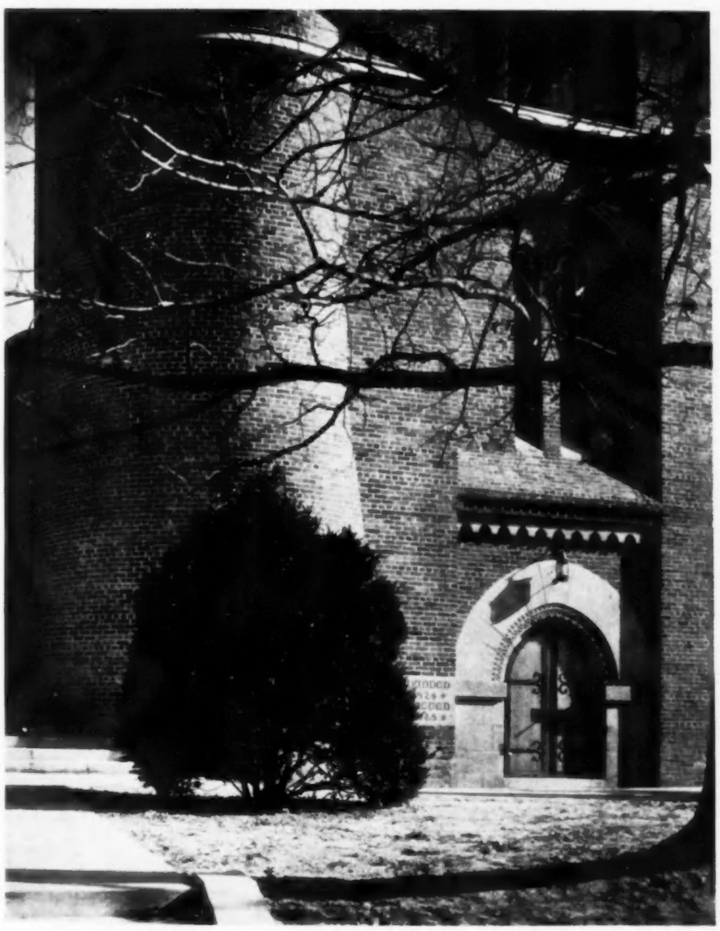
FIRST FLOOR PLAN

FIRST PRESBYTERIAN CHURCH,
GREENSBORO, NORTH CAROLINA.

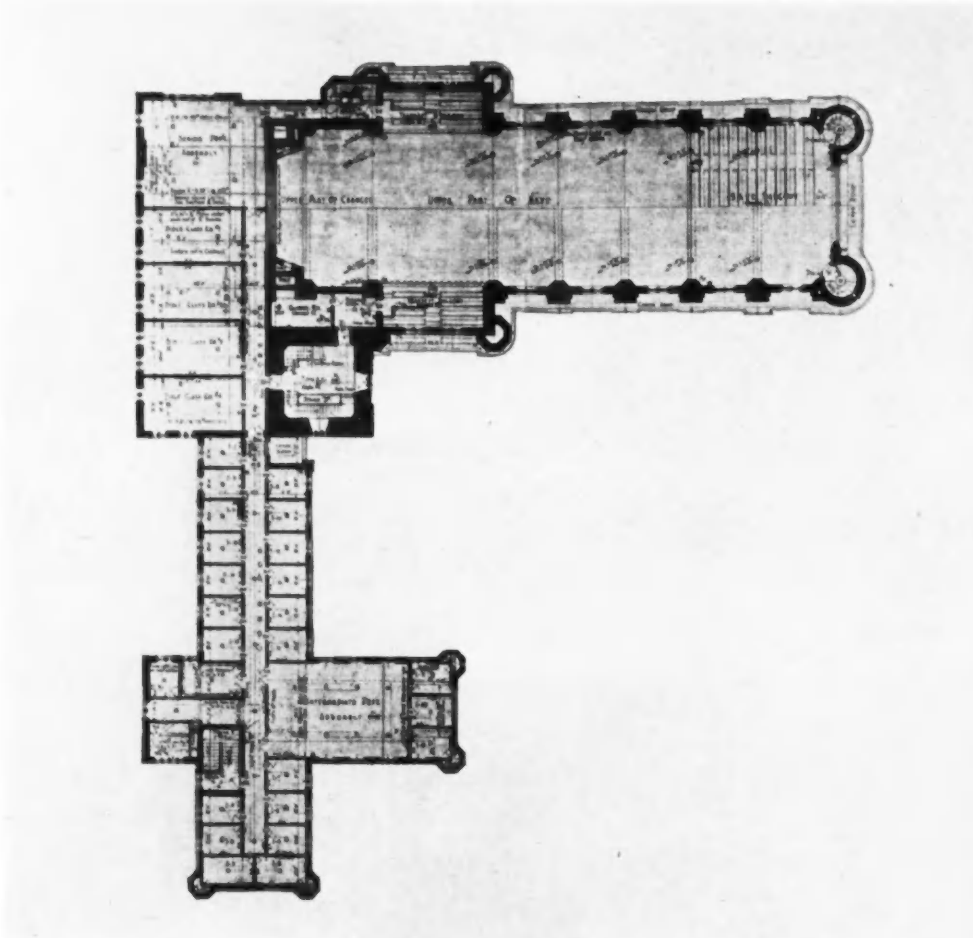
HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT



Photos. Tebbs & Knell, Inc.



FIRST PRESBYTERIAN CHURCH, GREENSBORO, NORTH CAROLINA.
HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT



SECOND FLOOR PLAN

FIRST PRESBYTERIAN CHURCH,
GREENSBORO, NORTH CAROLINA.

HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT

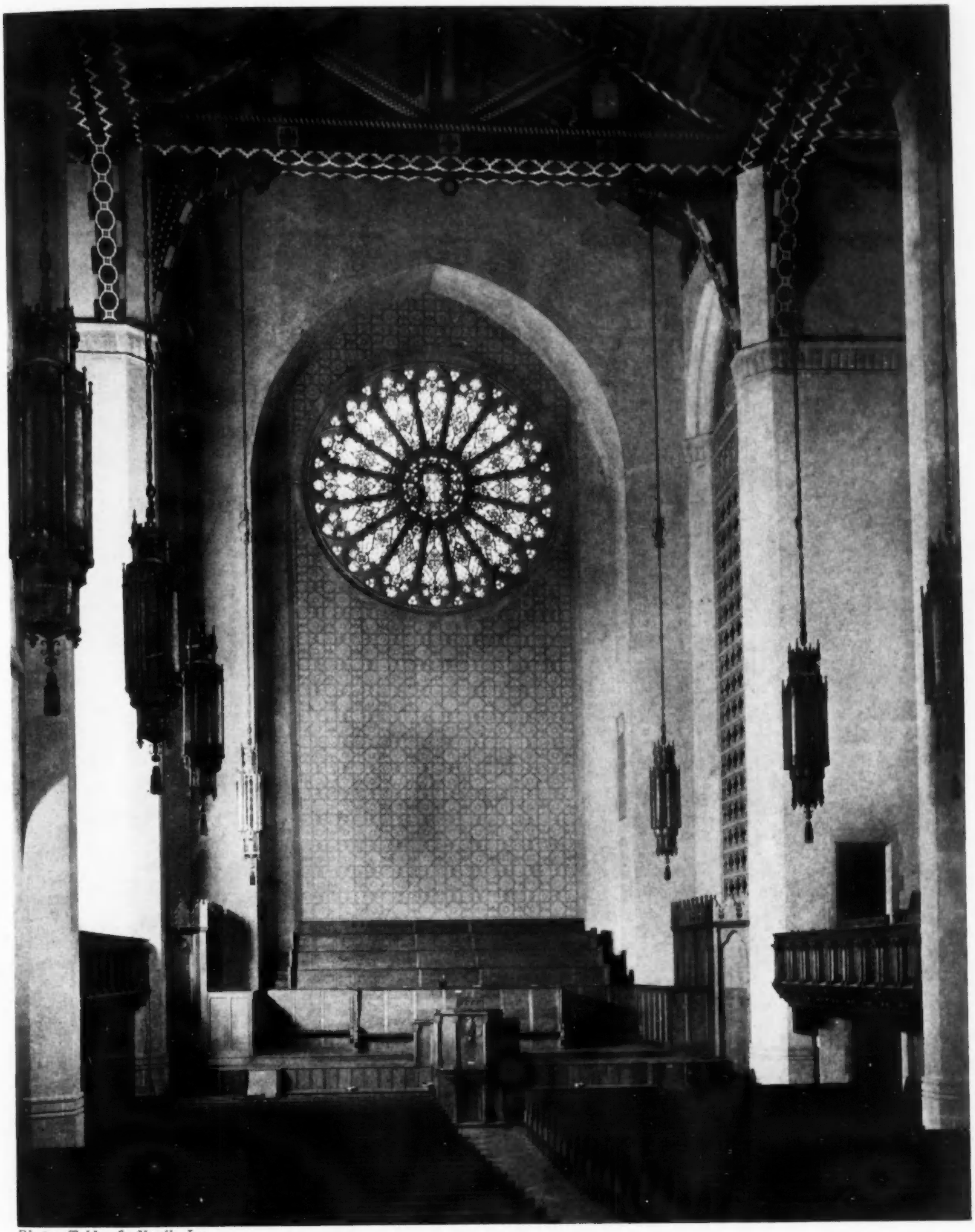
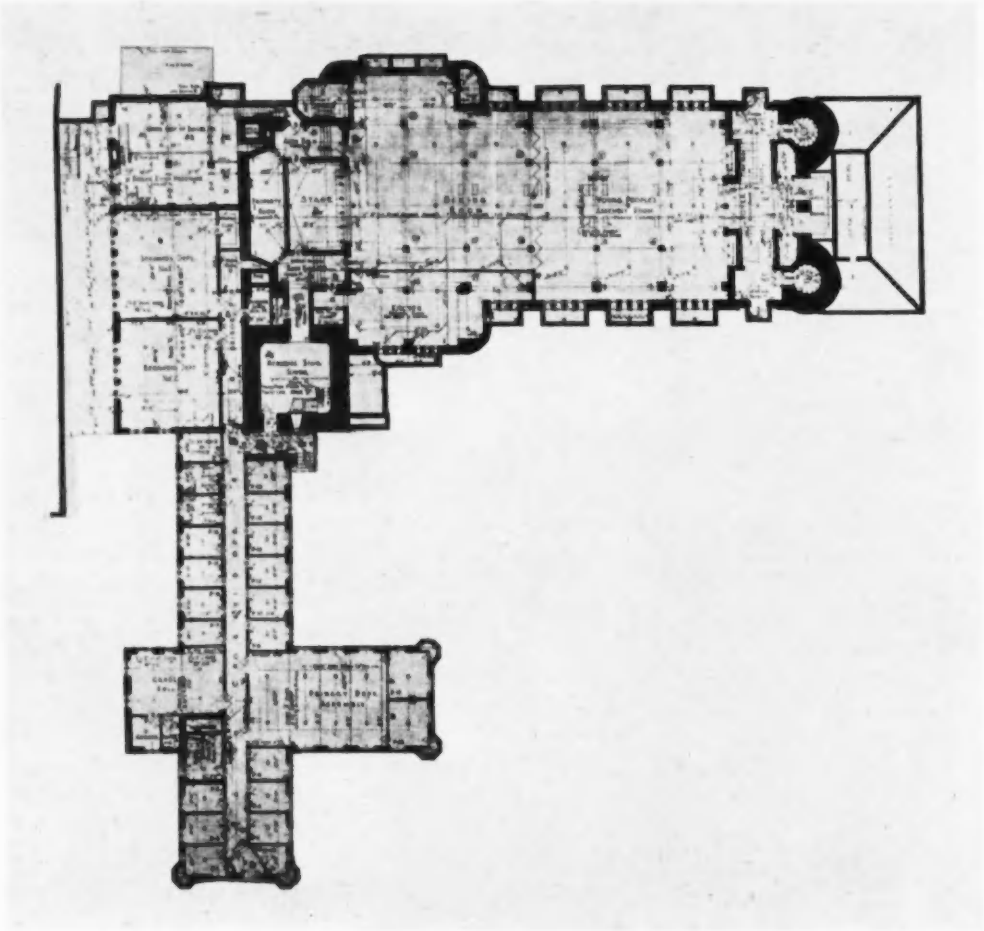


Photo. Tebbs & Knell, Inc.

FIRST PRESBYTERIAN CHURCH,
GREENSBORO, NORTH CAROLINA.

HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT



BASEMENT PLAN

FIRST PRESBYTERIAN CHURCH,
GREENSBORO, NORTH CAROLINA.
HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT

Photo. Tebbs & Knell, Inc.

FIRST PRESBYTERIAN CHURCH,
GREENSBORO, NORTH CAROLINA.

HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT

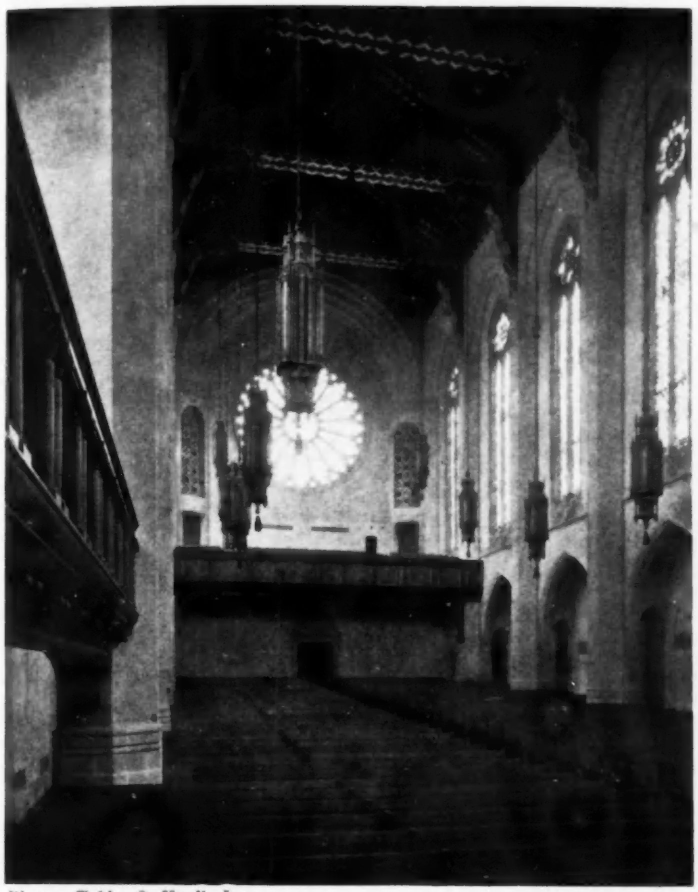
CRITICISM

IT is refreshing to find a new traditional note used as the inspiration for this cathedral-church in Greensboro. The term "cathedral-church" is used on account of the vast size and dignity of this great religious edifice, which was erected for neither the Catholic nor the Episcopal Church. For a Presbyterian Church body to show such breadth of view and architectural appreciation is praiseworthy indeed. Of all the various denominations of the Protestant Church, the Presbyterians, like the Baptists and Methodists, are most conservative in the architecture of their houses of worship. There is a bigness of scale combined with a tremendous sincerity and simplicity of detail which sets this church building apart as one of the most unique and interesting ever erected in this country. Although in no way a copy or even an adaptation, this design of Hobart Upjohn's suggests as its inspiration the great cathedral church of St. Cecilia at Albi in southern France. Here also brick was used throughout the construction of the building, and here also strong buttress-like piers separating each of the windows rise to a flat parapeted top.

Some idea of the size of this building may be obtained from the reproduction of the photograph showing part of the side of the church and the front elevation of the Sunday School building. In the corner turrets of this building the spirit of French Romanesque architecture is again suggested. Possibly this building would have added more to the scale of the church itself had the high pitched roof been omitted. As apparently there are no additional rooms under this high roof, it would seem almost better to have omitted it and to have kept the roof of this parish house flat, terminating the walls of the building in some sort of a corbeled course with flat coping. Or even a roof of very low pitch similar to that of the church itself would have been preferable.

The severity of the bare, brick walls of both the church and parish house is offset by the interesting carved detail of the several entrance doors. This detail is more Saracenic than Romanesque in character, but it might well have been inspired originally by the returning crusaders who were strongly influenced by their pilgrimages to Turkey, Arabia and the Holy Land. The great tower which will eventually dominate the church has yet to be built. When completed it should be a landmark equal in importance and in dominance to the towers of the numerous cathedral-churches scattered through the south of France. There is some satisfaction in designing a great church with an imposing tower for a town such as Greensboro, where it may dominate not only the town itself but the entire countryside.

It is pleasing to enter this great church, because the interior repeats not only the great scale of the exterior but also its simplicity of detail and warmth of coloring. The dark oak of the pews, pulpit and choir stalls contrasts pleasantly with the warm buff and terra cotta tones of the walls and organ screen. Decorative richness is successfully and appropriately added by the interesting series of hanging lanterns on each side of the great nave and by the brilliantly painted decorations of the open rafters and beams which support the roof. There surely is no more certain way of obtaining that subtle quality of religious feeling in the interior of a church building than by such a combination of tremendous height and simplicity of treatment as Mr. Upjohn has carried out with such success in this Presbyterian Church.



THE NAVE, FROM THE CHOIR

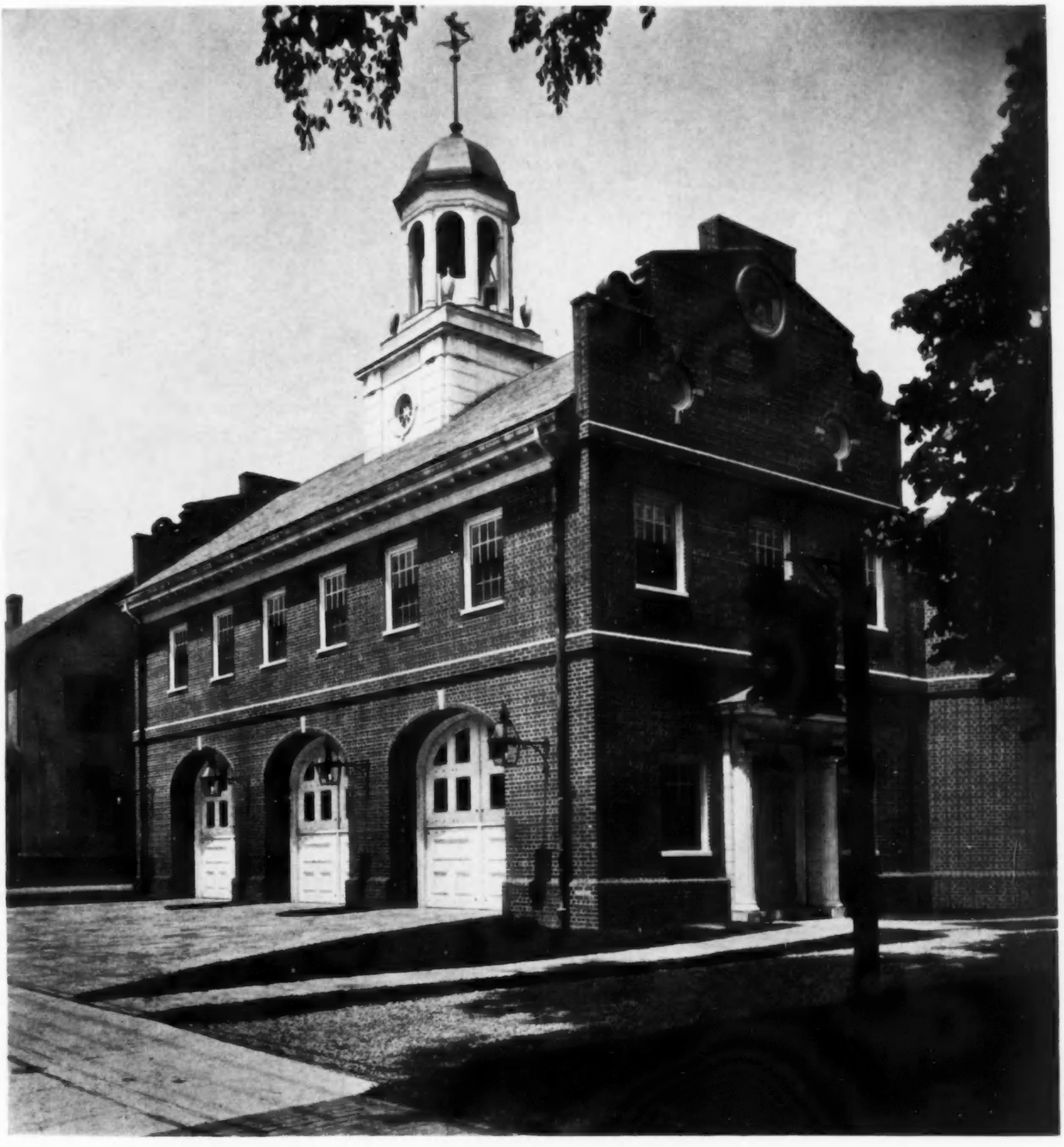
FIRST PRESBYTERIAN CHURCH,
GREENSBORO, NORTH CAROLINA.
HOBART UPJOHN, ARCHITECT
H. BARTON, ASSOCIATE ARCHITECT

Photos. Tebbs & Knell, Inc.

PULPIT AND CHOIR

ARLINGTON FIRE STATION

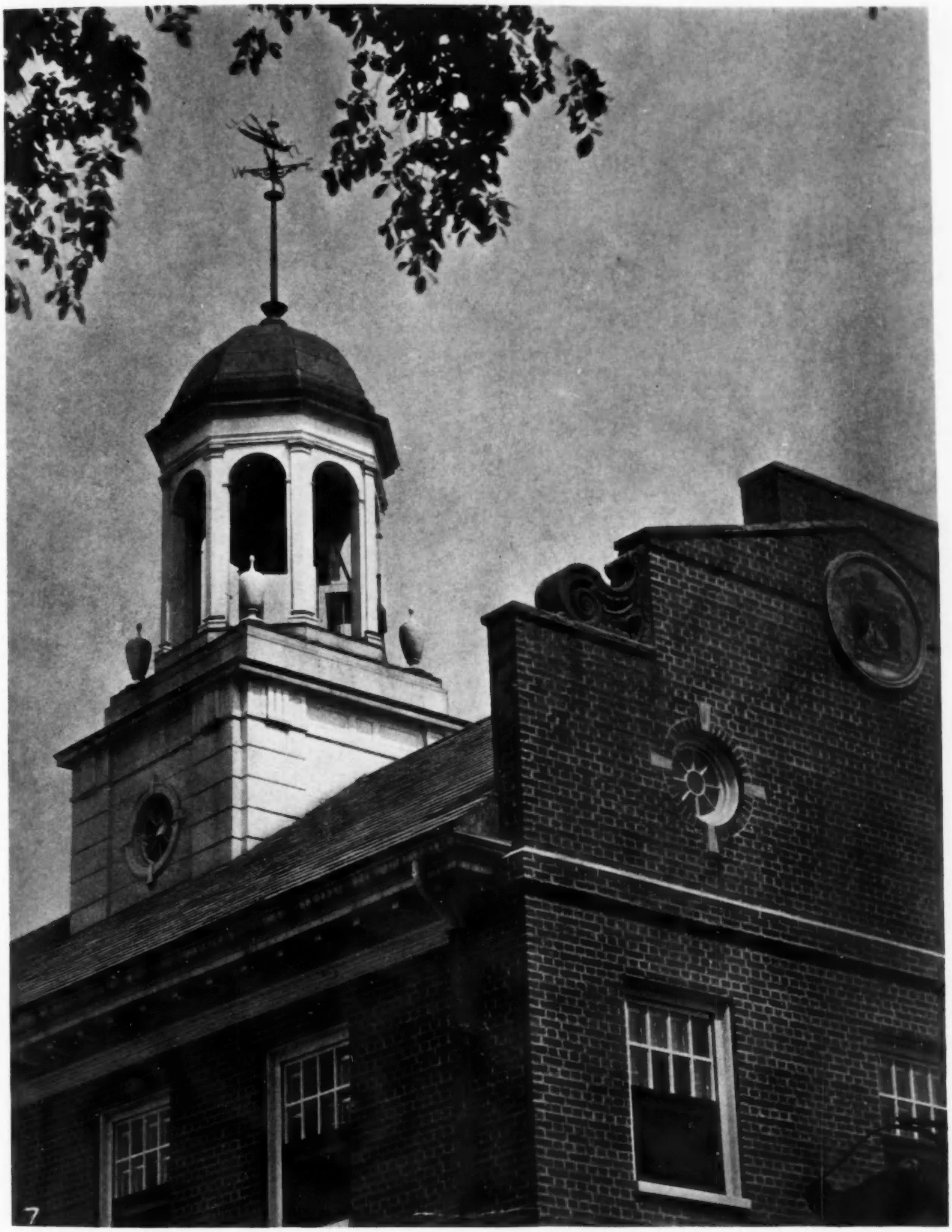
ARLINGTON, MASS.



GEORGE ERNEST ROBINSON
ARCHITECT

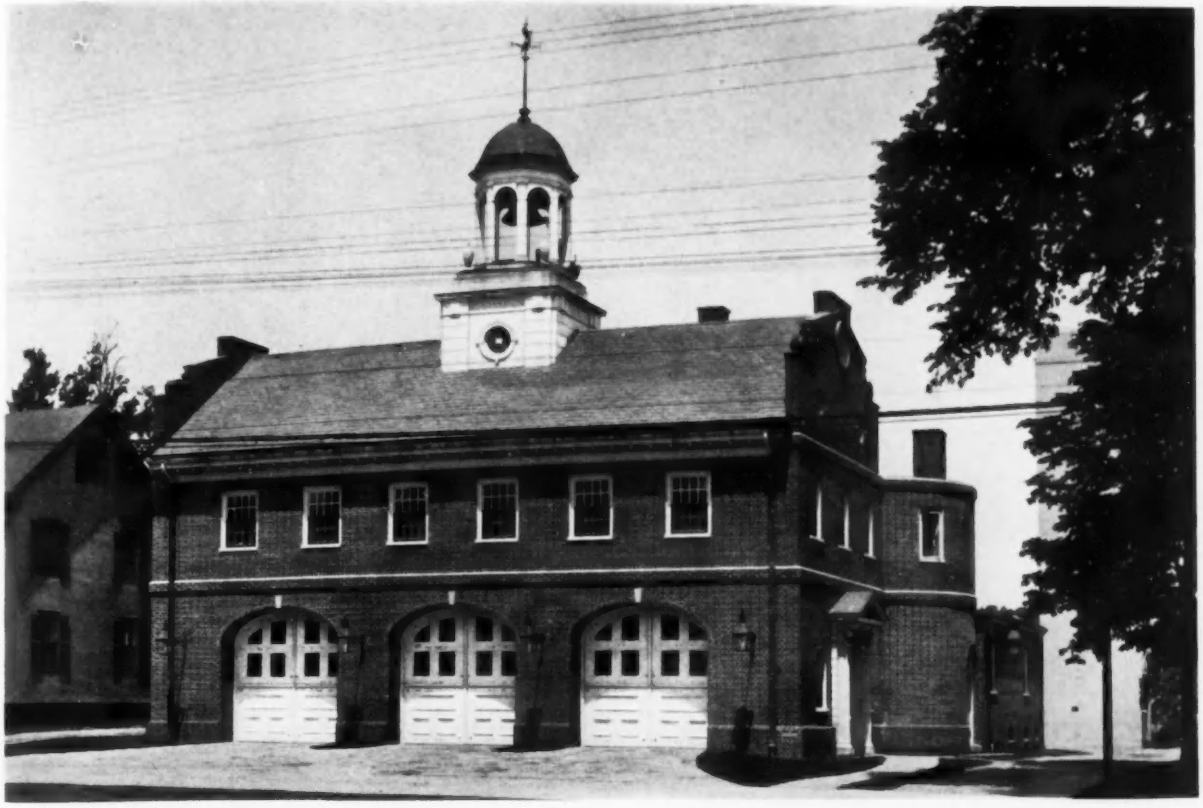
CRITICISM

HERE is a municipal building, in the design of which the architect has drawn his inspiration directly from Colonial precedent. It seems to be more luxurious than most buildings having the same purpose, but the firemen will probably enjoy the club-like atmosphere provided for them. The Colonial details have been used with decided freedom, particularly on the exterior of the building, where the details of the center belfry or cupola as well as the side entrance door are considerably heavier than would probably be found in the original Colonial work from which they were adapted. From the point of view of design the belfry seems a little too large for the building as a whole, but in itself is pleasing in design. The interior architecture is also that of the Colonial period. The doors and paneling as well as the sparse furnishings of the main living room are early New England in character. The small memorial library and little sitting room with the old-fashioned fireplace are quite unusual features in a firehouse. They give a very pleasant, homelike character to an otherwise strictly practical and utilitarian building.



CUPOLA, CORNICE AND END WALL

FIRE STATION, ARLINGTON, MASS.
GEORGE ERNEST ROBINSON, ARCHITECT

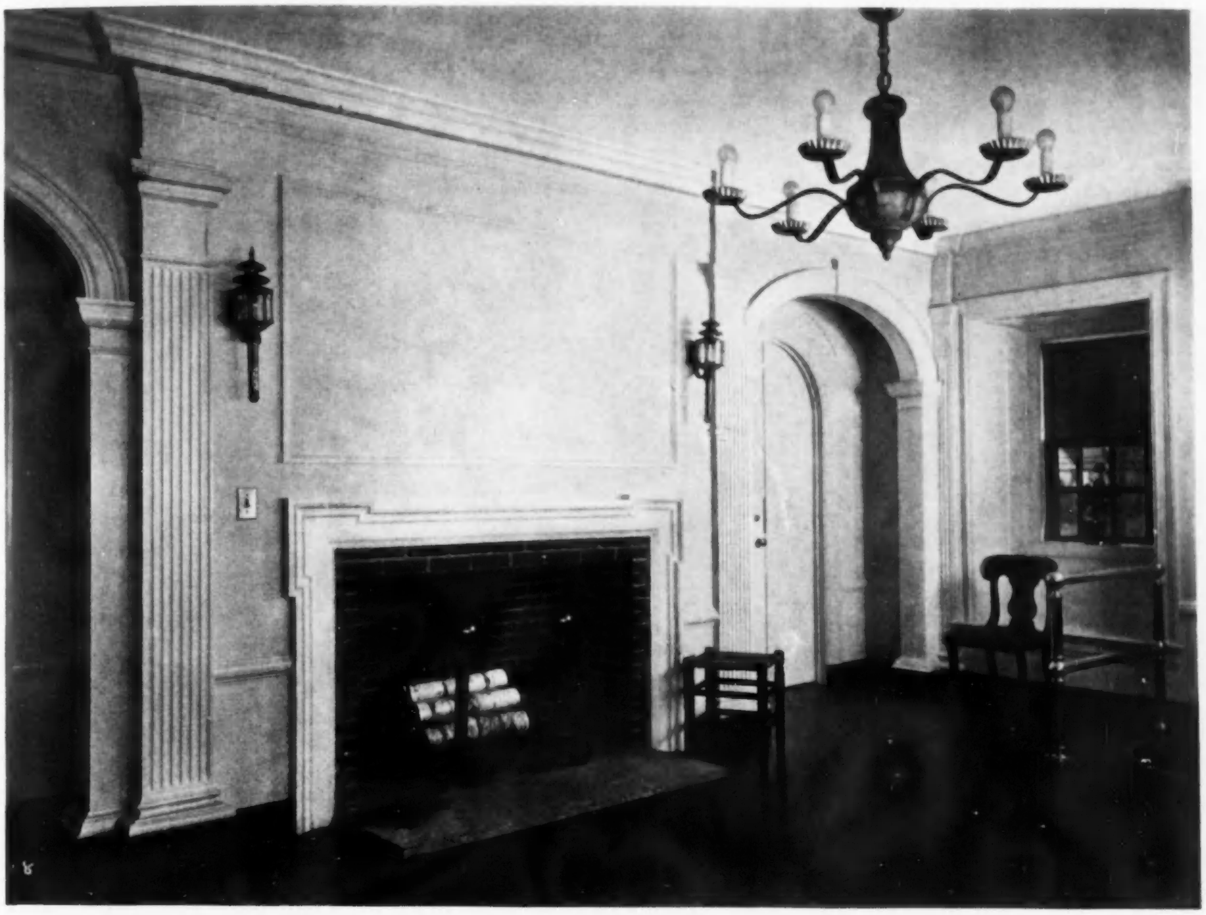


FRONT AND REAR VIEWS

FIRE STATION, ARLINGTON, MASS.
GEORGE ERNEST ROBINSON, ARCHITECT

ENTRANCE DETAIL

FIRE STATION, ARLINGTON, MASS.
GEORGE ERNEST ROBINSON, ARCHITECT

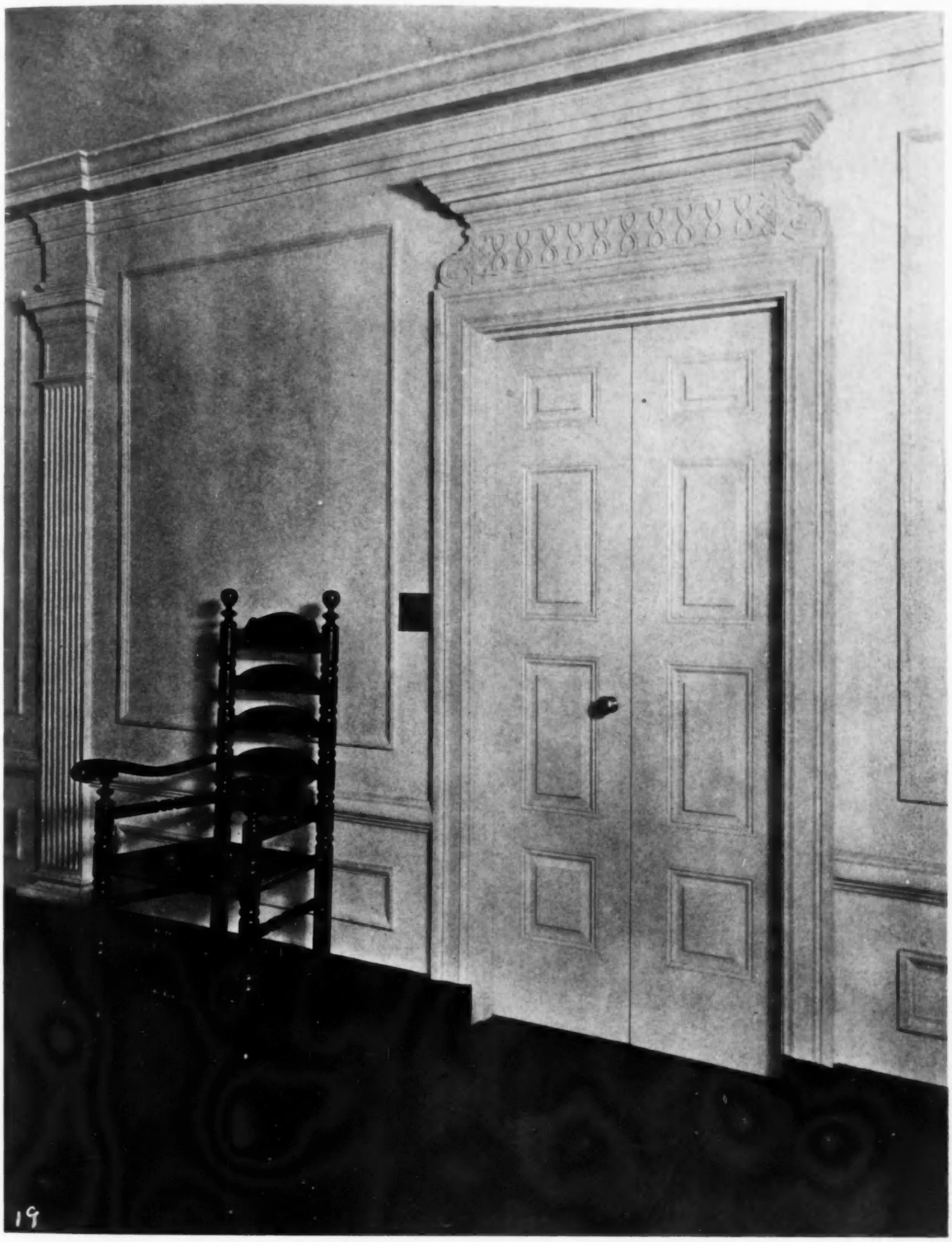


LIVING ROOM AND STAIR HALL

FIRE STATION, ARLINGTON, MASS.
GEORGE ERNEST ROBINSON, ARCHITECT

LIVING ROOM AND CIRCULAR HALL

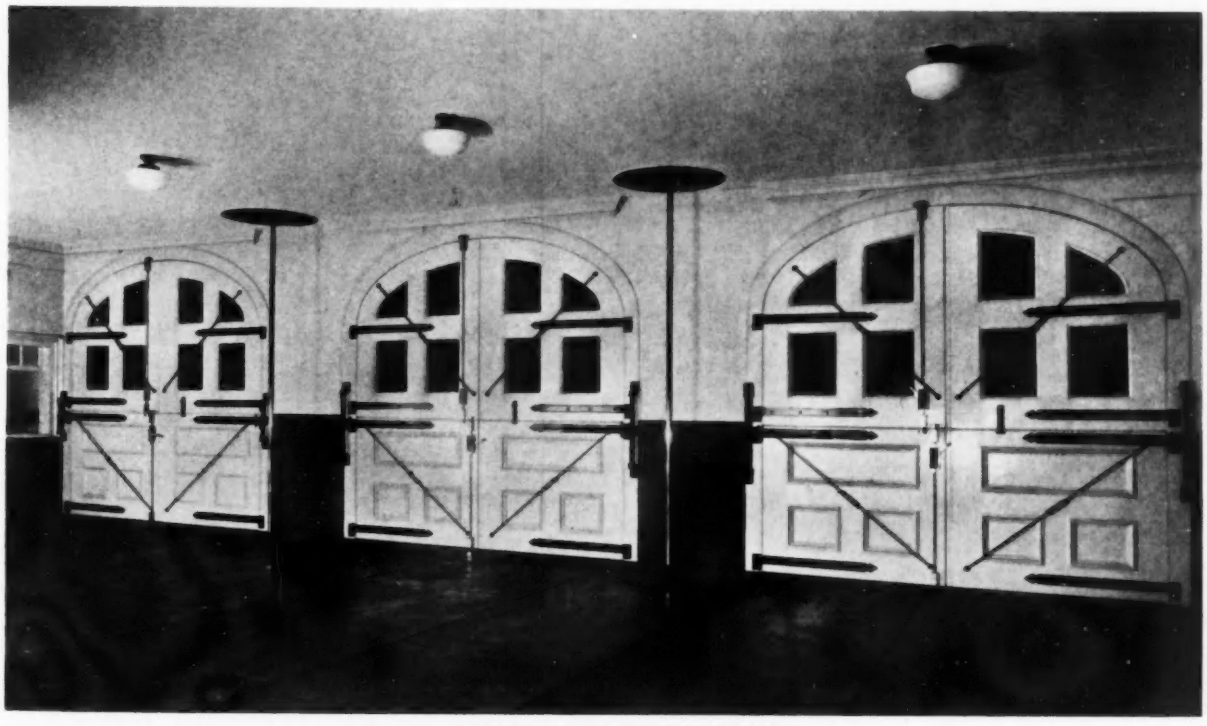
FIRE STATION, ARLINGTON, MASS.
GEORGE ERNEST ROBINSON, ARCHITECT



DETAIL OF LIVING ROOM DOOR

FIRE STATION, ARLINGTON, MASS.
GEORGE ERNEST ROBINSON, ARCHITECT

LIBRARY ALCOVE



DOORS TO APPARATUS ROOM

FIRE STATION, ARLINGTON, MASS.

GEORGE ERNEST ROBINSON, ARCHITECT

THE HOTEL FOR THE SMALL CITY

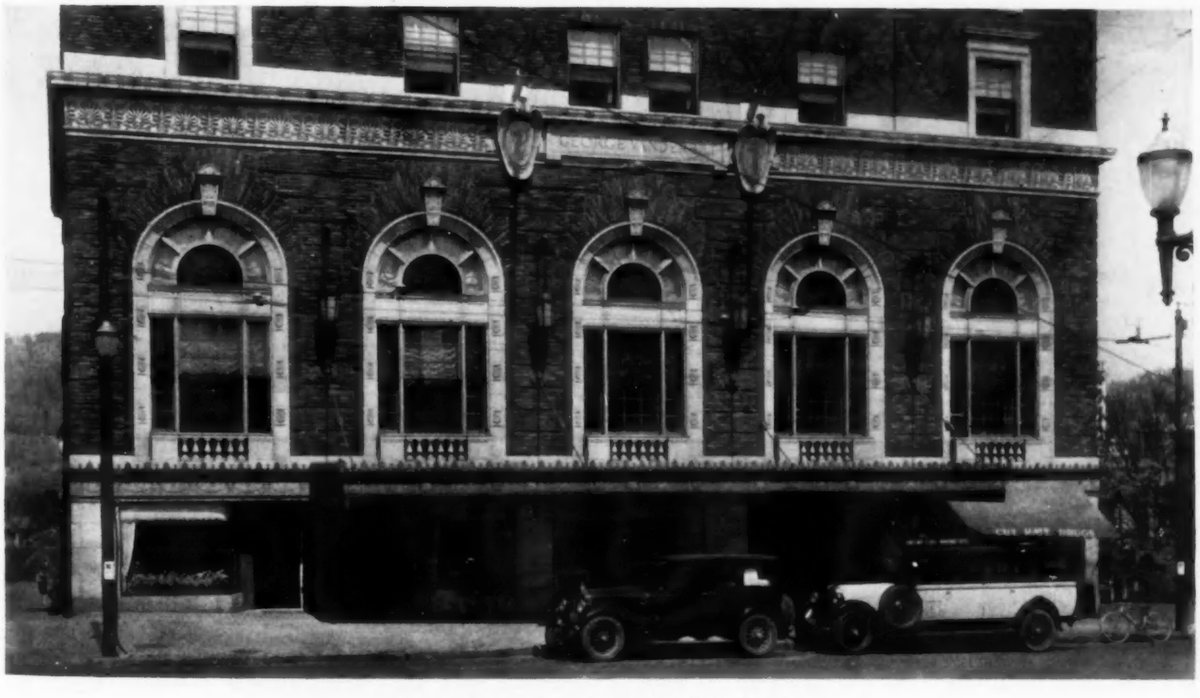
BY

W. L. STODDART

THE hotel designed for the city of say 30,000 or so should never be regarded as merely a small edition of the large metropolitan hotel. Everything in connection with its design and appointments involves considerations that arise from local requirements and conditions. From start to finish it is a local project, and as such the first thought of building a new hotel should originate in the mind of one of its progressive citizens, and should spread quickly through the local chamber of commerce and other civic organizations. Every hotel project passes through much the same sequence of steps. It will proceed from its first inception to the formation of a hotel committee, thence to consideration of the problem of financing, determining the size of the hotel, choosing the site and selecting the architect, and so on to the finished result.

USUAL PROCEDURE

After it has been suggested that the city needs a new hotel, the first step toward getting action is to sound out local support,—local editors will be interested in giving the project newspaper publicity,—to get the Rotary, Kiwanis and other local organizations to spread the idea, and, as far as possible, to enlist the coöperation of the most important banks, merchants and business men. Generally a committee is formed, and as soon as the proceedings reach a point where a definite estimate of finance is needed, the question of cost arises. How much is this new hotel going to cost? The answer to this is, of course, based entirely on the size and plan of building, and this is a consideration to which careful thought must be given; good judgment dictates under-building rather than over-building. It is always better to allow for a later "addition" to accommodate future growth than to attempt to carry a larger hotel with insufficient patronage. Various factors need to be investigated and weighed. Securing tourist trade and conventions will depend upon the kind of city and upon its location, which may or may not be on a main line of a railroad or a motor highway. The attractions or lack of attractions of the city to visitors must be clearly recognized. Local organizations, such as Rotary, Kiwanis, women's clubs or Junior League must be seen with regard to the number and character of luncheons, dinners and social gatherings that might be held at the hotel. This advance information will furnish



George Vanderbilt Hotel, Asheville, N. C.
W. L. Stoddart, Architect

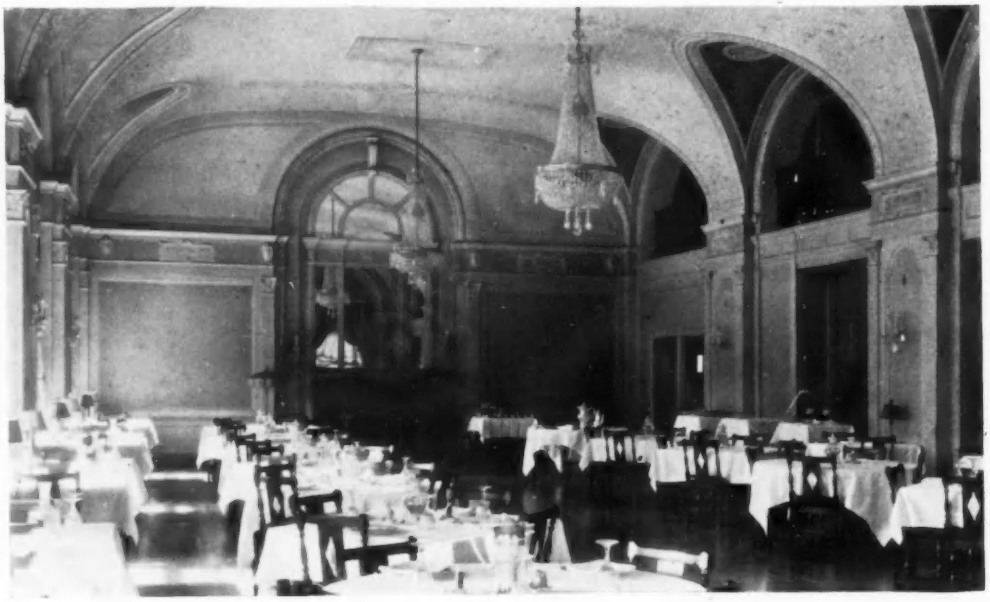
some degree of guidance in considering the amount of public space in dining rooms and ball room that can be safely provided, while existing hotel accommodations and the actual demand for the new hotel, will dictate the number of rooms. All these factors can and should be carefully tabulated, and the committee should not make the mistake of deciding on a hotel similar to that seen in some other city, even if that city appears to be closely similar. Social and business conditions in no two cities are exactly alike, and the only conditions to reckon with are those prevailing in the city in which the proposed hotel is to be built.

SIZE AND COST

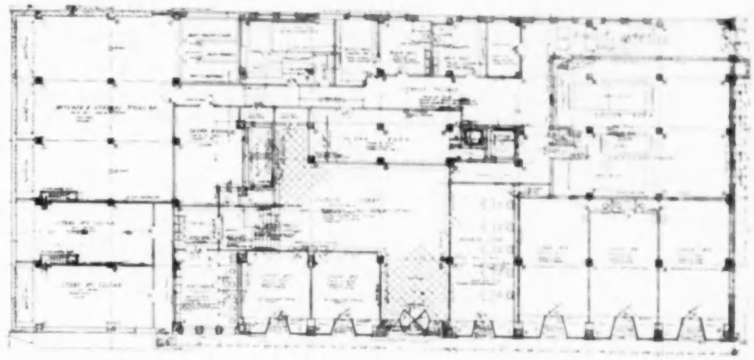
In size it may range from 100 to 150 rooms, and from 200 to 300 rooms for larger cities . Approximate cost has sometimes been figured in advance of preparing preliminary plans or specifications based upon unit costs per room, but this method often proves inaccurate, and it can be used only as an approximation. Cost is more accurately figured on cubic-foot basis, but in order to provide dependable figures for such an estimate it is necessary to have preliminary plans in order to know how much area is for public space, etc.

VALUE OF EXPERIENCE

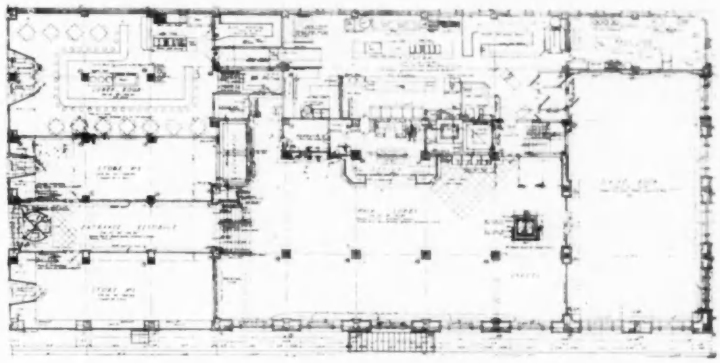
It is at this juncture that the architect experienced in hotel planning and construction can clarify the whole situation and provide some definite basis of cost data and other information and advice upon which to proceed; and he may be of great assistance also in the selection of the site, which may well have much to do with the kind of building he would recommend. Such data, based upon actual experience, provide information as to the amount of money to be raised. It can then be determined in advance,



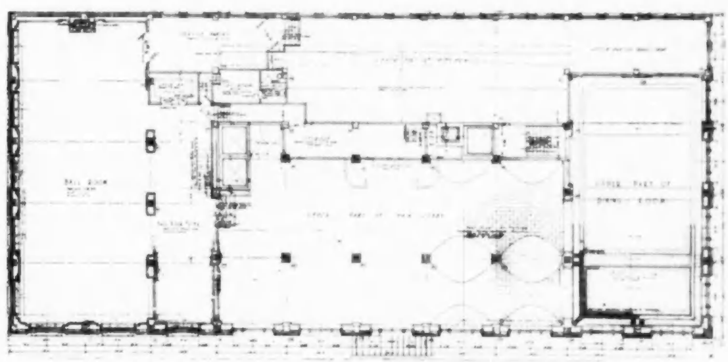
George Vanderbilt Hotel, Asheville, N. C.
W. L. Stoddart, Architect



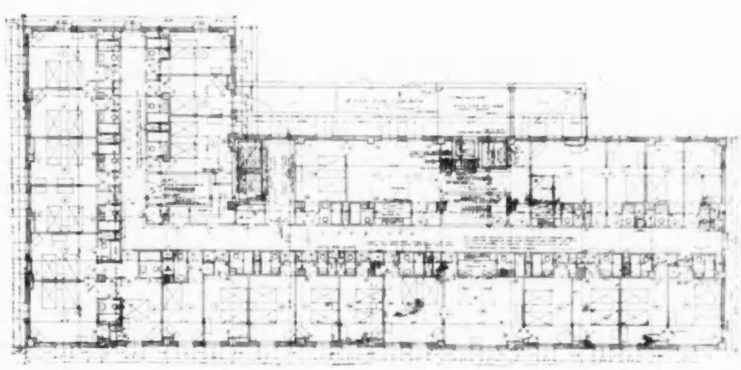
Basement



Main Floor

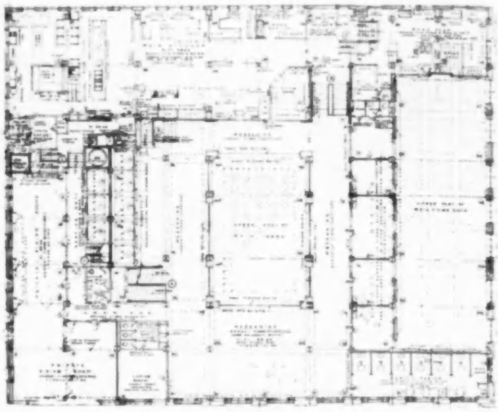


Ball Room Floor

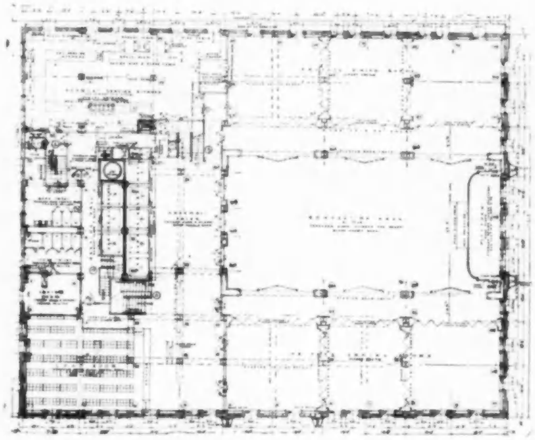


Typical Floor

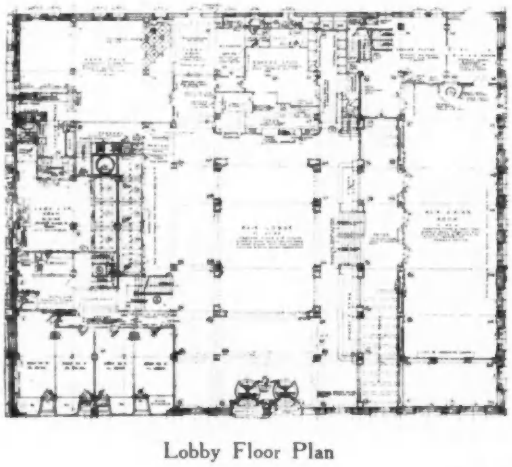
Plans. George Vanderbilt Hotel, Asheville, N. C.
W. L. Stoddart, Architect



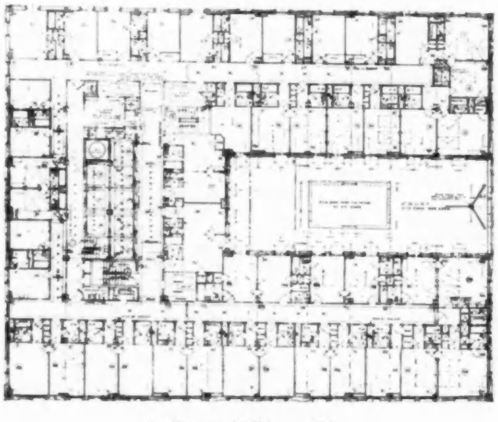
Mezzanine Floor Plan



Second Floor Plan



Lobby Floor Plan



A Typical Floor Plan

Lord Baltimore Hotel, Baltimore
W. L. Stoddart, Architect

Dining Room. Lord Baltimore Hotel, Baltimore.
W. L. Stoddard, Architect

provided there are no unknown or conjectural factors and provided the exact amount involved must be determined before any actual financing can proceed. To raise a stated amount, it has been found that it is very difficult to get the support of local banking institutions or mortgage firms unless at least one half the amount required has been subscribed or pledged in stock or bonds by local backers or investors. With this proof of local support, the rest of the financing proceeds with little or no difficulty. Another method is to place the entire matter of raising funds in the hands of a specialist in financing, and this is often done.

SITE IMPORTANCE

The question of site is of vital importance,—no one factor, indeed, has so often adversely affected the success and prosperity of the small hotel. The investment in the building, in the first place, is too great to jeopardize by the false economy of choosing an undesirable site. The strategically right site will, in the end, pay more than its difference in cost. A hotel cannot afford to be poorly located. Convenience often suggests its location in the heart of the business district, and it can also be planned to cater to the social side of the city's life. It has been my personal observation that the best retail business follows the residential development of the smaller cities, and that the hotel should therefore be located near this natural growth of the business section of the city, where the more exclusive shops approach the better residential section. The committee should make a careful study of the whole trend of the city's development so that there will be no danger of the hotel's being left behind by a move of the city's more desirable section within a few years' time.

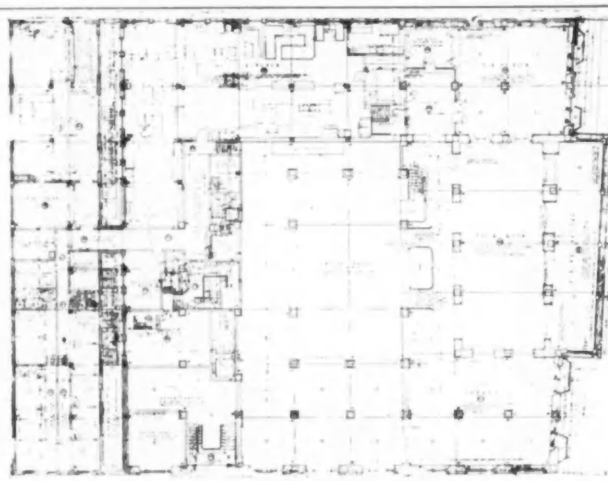
PLAN FACTORS

With size, cost and site determined, the architect is now called upon to design an efficient, modern, attractive hotel within the conditions thus established, and in this problem his past experience is the committee's best assurance of a successful solution. Necessary standard construction must obviously come first out of the total figure, after which the lobby, the lounges, dining rooms and other public portions of the building can be given as distinguished and attractive an appearance as circumstances will allow. In preparing the plan for the small hotel it is important to remember that the guest rooms, the street-level stores and an easily accessible lunch room are the profitable elements and that the public portions are non-productive of revenue. The latter must, in fact, be covered by the former. Regardless,

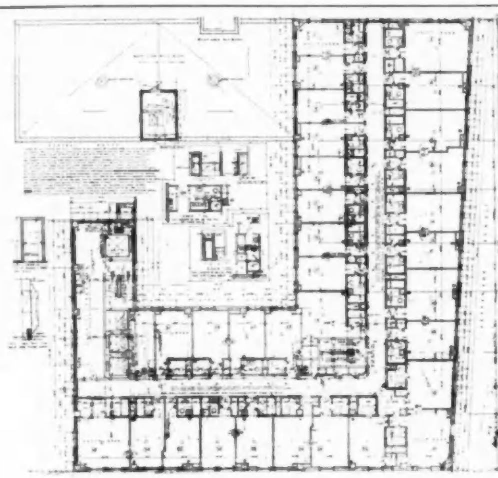
therefore, of the ideas of the less practical and more ambitious members of the committee, the architect must stand firm on keeping down the cost of non-productive parts of the hotel. Above the two lower floors, economy in construction is best served by using a uniform plan, so laid out as to provide the room accommodations most in demand in the smaller hotels.

INCLUDED IN "COST"

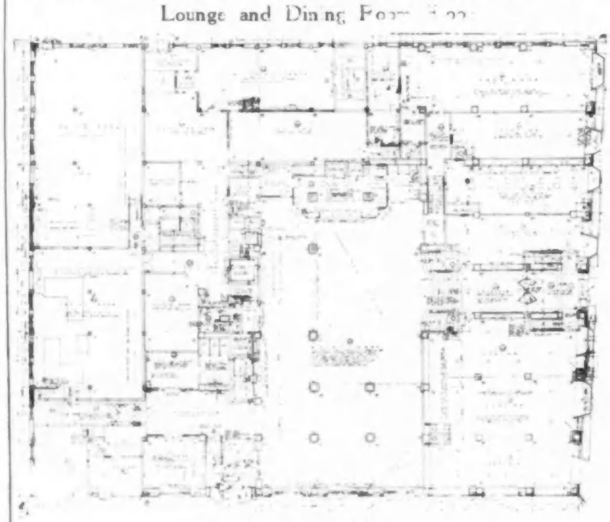
In planning the total cost it is essential not only for the committee but for the prospective lessee to know from the start that the architect's estimate does not include kitchen equipment, linen, silverware, draperies, or any of the movable furniture. The estimated building cost, however, includes, besides the actual structure itself (exclusive of property) all painting, papering and decorative work, all electric fixtures, vacuum cleaning equipment, mail chute, bath accessories and mirrors, refrigerating machinery, refrigerators, telephone, screens and weather strips.



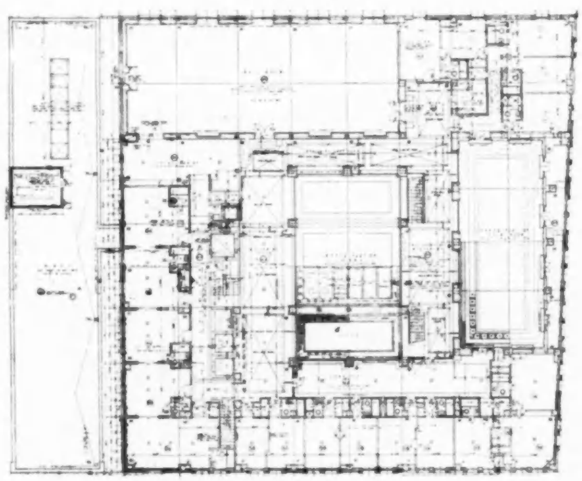
Lounge and Dining Room Floor



A Typical Floor



Lobby Floor Plan



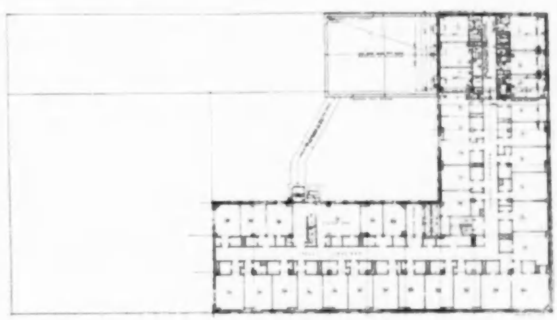
Second Floor

Hotel Patrick Henry, Roanoke, Va.
W. L. Stoddart, Architect

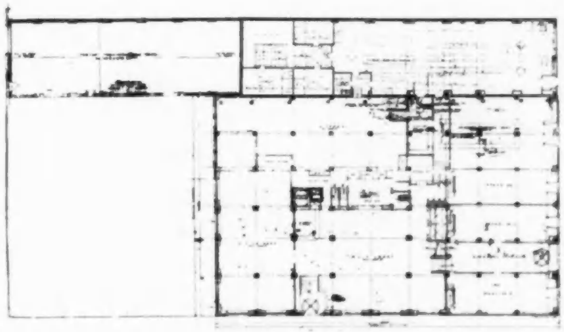
Hotel Yorktowne, York, Pa.
W. L. Stoddart, Architect

LOCAL CONDITIONS

Throughout the promotion and planning of the hotel for the small city the principal thing for committee and architect alike to keep in mind is the importance of accurately surveying and understanding all local conditions. Lack of confidence in the growth, progressiveness and general future of the city proves, of course, unfortunate, and it may even block the whole project of the new hotel, while on the other hand over-confidence and hopes for civic expansion not warranted by the facts will lead to the building of a hotel of which the overhead is too high to be supported by local patronage. Mistakes in both directions are often made, and if a committee is in any doubt as to the size and type of hotel it should promote, the counsel of the architect should be of real assistance because of his practical first-hand experience with actual hotel operations in other and perhaps similar communities. He is in a position to recommend a safe course between committee members who may be on the one hand too pessimistic or on the other too optimistic. Somewhere between the two lies the safe course, and there is no city, whatever its size, which cannot, through intelligent procedure, find a solution for its hotel problem. The entire field of architecture presents no more important and interesting problem than the designing and planning of a hotel, because so many factors are involved, and experience is of utmost value, if a sound economic solution is necessary.



A Typical Floor Plan



Main Floor Plan

Hotel Yorktowne, York, Pa.

LOBBY

CAFETERIA

HOTEL YORKTOWNE, YORK, PA.
W. L. STODDART, ARCHITECT

BOOK DEPARTMENT

VALUATING AND APPRAISING EXISTING BUILDINGS

A REVIEW BY
ARTHUR T. NORTH

VALUATION REPORT ON THE WISCONSIN BUILDING, CHICAGO. By Henry A. Babcock. 14 pages, appendix, 21 schedules, plans and map; paper. Price $5. National Association of Real Estate Boards, 59 East Van Buren Street, Chicago.

APPRAISAL REPORT, COURTNEY APARTMENT PROPERTY, MINNEAPOLIS. By Edwin L. Somerville. 24 pages, including appendix, 8½ x 11. Price $5. National Association of Real Estate Boards, 59 East Van Buren Street, Chicago.

THERE was a time in popular opinion when a building investment was in the preferred class. A building was owned usually by an individual or by a corporation occupant. The change from individual to corporation ownership is now practically universal for buildings of major importance. The security of building investments is no longer a matter of course. Competition, demand, location, efficient plan and numerous other factors have a direct influence on the investment. Obsolescence is, perhaps, the most important influence on the permanence of the investment. Instead of entering blindly into a building project based on the owner's or some other person's judgment, it is necessary to make an exhaustive investigation of every factor that can influence the success of the project.

As a means of assurance of the success of a building project, its appraisal has been standardized by experts. Based on the past experience of buildings, on a logical and scientific analysis of all the collateral factors, these appraisal reports have been prepared. The Wisconsin Building report is given a fictitious name and location. The reports present a procedure for preliminary investigation of location, analysis of the plan to determine the income and operating expense, the scheme for financing the project, and the probable experience of the building. Complete analytic schedules are presented.

It will be found that compiling a well considered valuation report is a matter of considerable labor and expert judgment. It is safe to say that no building project can, in these days, succeed when based on off-hand

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opinion. Projects must be "debunked" if success is desired, and that process will be considerably facilitated by the study of these reports. Not only are they of value to architects, but also to owners, realtors, investment bankers and contractors,—it may prevent contractors from becoming involved in improperly planned and financed projects which are likely to result in disaster.

AMERICAN HOUSING. By E. L. Allen. 216 pages, 5½ x 8 inches. Illustrated, cloth. Price $2. The Manual Arts Press, Peoria, Ill.

THE author has not made a recital of the mere architectural changes in American dwellings from their beginnings. These changes have been correlated with the social, economic and political conditions, inventions, scientific discoveries, immigration and numberless other factors that influence housing. The purpose of this investigation of the development of the American home is to help determine the features most desirable in houses for certain conditions or types of family life, so that we shall have a basis for deciding what certain individuals need or can afford or attain in housing.

Notwithstanding the quick or slow adoption of fashions and fads in house building, and their displacement by newer forms, there has been a steady evolution that is caused by numberless things, the influence of which may vary for many reasons. Too much attention is given at this time to the architectural style of the house rather than to the inescapable effects of social, economic and political conditions. Inventions in sanitary, heating, lighting and domestic apparatus have their effect on the convenience of housekeeping and the physical comfort of the occupants, but the architect and the house owner must give consideration to many other factors that affect the social welfare of the occupants.

A reading of this work defines clearly many influences that we have, perhaps unwittingly, accepted and which we cannot intelligently utilize. Its reading should be general among architects, builders, and laymen as well.

THE AMERICAN SCHOOL AND UNIVERSITY; A YEAR BOOK. 571 pages, 7 x 10 ins. Illustrated, cloth. Price $5. The American School Publishing Company, 443 Fourth Avenue, New York.

THE ten sections of this Year Book are devoted to the design, construction, equipment, utilization and maintenance of educational buildings and grounds. The sections are subdivided into special topical subjects, each written by competent authorities and adequately illustrated. The whole range of building construction and equipment is covered and, as these books are issued annually, they are up to date and contain the latest information available in book form. There is no form of architecture in this country that is so sensitive to changing conditions as that of educational buildings, a tribute to the coöperation which exists between architects and educational authorities. For this a year book is essential as a recording of the ever-changing factors of school and university buildings. Not only is this work of value to architects, but it will be also of value to landscape architects, school boards, and school superintendents.

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Number Two — New York, N. Y., MURray Hill 7320 — October, 1930

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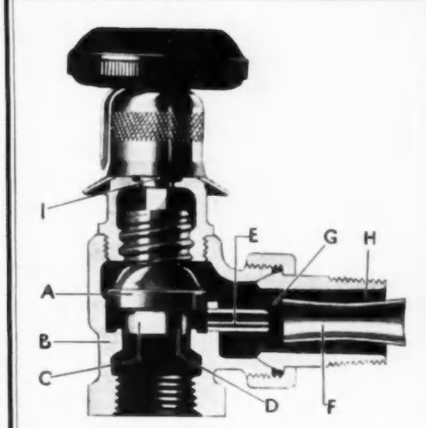
Reports of results of engineering tests are also available for the asking.

See address above.



Valve Half Open

How and Why the Cryer Valve is Unique and Better

When the valve is open up to $\frac{3}{4}$, steam enters the radiator only through the slot D, nozzle E and tube F. The jet of steam shoots out across the top of the radiator, dropping to the bottom and mixing with air and vapor. The incoming steam going from nozzle E into tube F, creates a partial vacuum at G, which pulls the humid mixture back thru the first section of the radiator through sleeve H to G. There it strikes the jet of steam and is recirculated. In this way the entire contents of the radiator are continuously circulated, heating the radiator evenly all over to a moderate temperature.

When the valve is opened more than $\frac{3}{4}$, steam enters through the large port over the nozzle E as well as through the nozzle E, filling the entire radiator immediately with steam at full temperature for heating the room rapidly.

Effects of Hot Water Heat Made Possible in Steam Systems

The newly perfected Cryer Radiator Control Valve not only permits steam radiators to be heated *evenly* all over to any temperature between 90° and 212° F., but *holds* the radiator constantly at the temperature required. This permits complete modulation of radiator temperatures for heating on mild, moderate or cold days.

In addition to the greater convenience afforded by this *complete* regulation, large fuel savings are achieved by eliminating over-heating and using the *entire* radiator at temperatures from 90° up, to heat the room. Ordinary modulating valves heat part of the radiator to steam temperature, leaving the rest cold, which is inefficient. This is eliminated by the Cryer Radiator Control Valve's positive method of circulating the heating mixture continuously throughout the radiator, as explained in another column, giving an equable heat like hot water.

Its makers state that the effect of this valve is to give to any two-pipe steam system—vacuum, vapor or gravity—the advantages and economies of hot water heating.

Where Installed

A few good examples of buildings using the Cryer Radiator Control Valve in New York City are the new office building at 10 East 40th St., the Chase National Bank at Nassau and Cedar Streets, and the Empire Trust Co., at 580 Fifth Avenue.

The Cryer Radiator Control Valve is made by D. G. C. Trap & Valve Co., Inc., 1 E. 43rd St., New York City, makers of Cryer Heating Systems and devices since 1898.

PROBLEMS IN ARCHITECTURAL DRAWING, Book II, Masonry and Steel Construction. By Franklin G. Elwood. 88 pages, 8 x 11 inches. Illustrated, cloth. Price $2. The Manual Arts Press, Peoria, Ill.

THE scope of this work is more than mere architectural drawing, as it includes problems in engineering, designing of masonry (including reinforced concrete), and steel construction. The presentation of these construction problems in the form of working drawings is confined to several types of buildings suitable for small towns and rural communities. Although the volume is intended primarily for the use of the student in senior high schools, or vocational schools, it will be found of value to the beginning draftsman in an architectural office as well as to the foreman or contractor or to anyone who may wish to make his own drawings. Prevalent, standard practice, as judged by the author, has been followed in preparation of the work.

HOUSING AND BUILDING. A Monthly Publication. Price 20 marks per annum. International Housing Association, Hansa-Allee 27, Frankfort a/M, Germany.

HOUSING, individual and community, especially the latter, has not received the study in America to which it is entitled. Unsatisfactory housing conditions, especially urban, in this country will necessitate an intelligent correction forced by social and economic conditions. The subject must be understood before a satisfactory solution can be made, and the necessary understanding cannot be gained without general and specific knowledge. Those who would prepare themselves for this work will find *Housing and Building* a valuable aid. The magazine is printed in German, English and French as an international publication, illustrating housing developments throughout the world. Although some foreign customs in plan and construction differ quite radically from ours, a study of foreign housing developments is a valuable aid in planning our own undertakings of that kind. The subscription price of 20 marks includes a membership in the International Housing Association as well as an annual subscription to *Housing and Building,* and also other publications.

THE DESIGN OF MASONRY STRUCTURES AND FOUNDATIONS. By Clement C. Williams, C.E. Second Edition. 603 pages, 6 x 9 inches. Illustrated, cloth. Price $5. McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York.

TO the first edition of this work, published in 1922, Professor Williams has added sections on those new developments that have been made during the interval since that time, and has made such revisions in the original matter as were necessary. While intended primarily as a classroom text book, it is also valuable as a reference work. Compared with some other works of the same character, the simplification of the purely mathematical text is apparent. The practical experience of the author as engineer of important works is reflected in the usability of the book, secured by the elimination of everything that is not immediately pertinent to the subject in hand. The quality of the paper used, the clearness of the illustrations and appropriate typography make this work very attractive. It can be accepted as a standard work and deserves extensive circulation.

THE
ARCHITECTURAL
FORUM

VOL. LIII, No. 4 OCTOBER, 1930

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STEEL WORKERS

FROM A PHOTOGRAPH
BY BROWNING STUDIOS

THE ARCHITECTURAL FORUM

VOLUME LIII NUMBER FOUR

OCTOBER 1930

THE STRUCTURE AND METAL WORK OF THE CHRYSLER BUILDING

WILLIAM VAN ALEN, ARCHITECT

SPEED has always been characteristic of American building construction. As the shape and form of buildings change radically, appropriate means for maintaining or increasing the rapid tempo must be provided. This is especially true when great height is a feature of the structure. Speed, as it affects every part of the building, is controlled by the rapidity of the steel erection,—that is the yardstick of speed measurement. Great height is a distinguishing feature of the Chrysler Building, and special facilities were necessary to maintain the required rapid tempo.

Hoisting steel to 1,044 feet above the sidewalk was a different matter from hoisting it a few stories high and placing it over a large area. In the Chrysler Building, as in other tall structures, the hoisting of steel was done in relays. The steel used above the 26th floor was hoisted to that level and placed on a landing platform, from which derricks above raised it to the several floors up to the 59th floor, where another lifting or transfer derrick was placed. As the setback was only 9 feet wide at these floors, it was necessary to construct temporary cantilever platforms, increasing the width of the platform by about 12 feet.

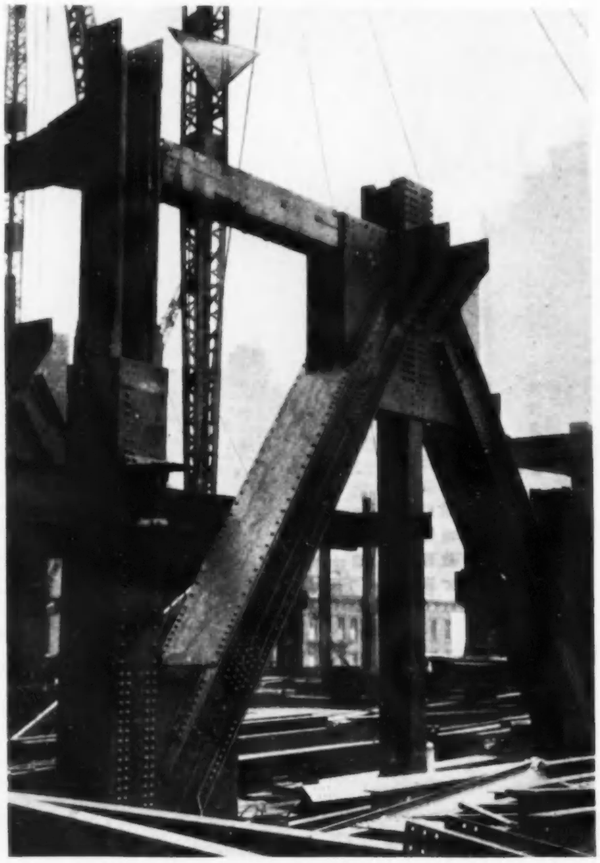
Speed of erection depends upon utilizing the capacity of the derricks. By using some derricks exclusively for hoisting steel to the proper floor levels and other derricks exclusively for setting the steel in place, steel is in almost constant motion until its final placement. By relaying the hoisting, excessively high lifts are avoided, and the resultant small amount of rope on the hoisting machinery drums permits high rope speeds.

Up to the 66th floor the usual methods of steel erection were employed. Above that level the work was unusually complicated by the dome-like nature of the construction. Many of the members are made up of very long curved angles that had to be laid out on the mold loft floor of the Federal Shipbuilding and Dry Dock Company, which fabricated these parts. The erection of this complicated structural frame required the most exacting effort of the erectors.

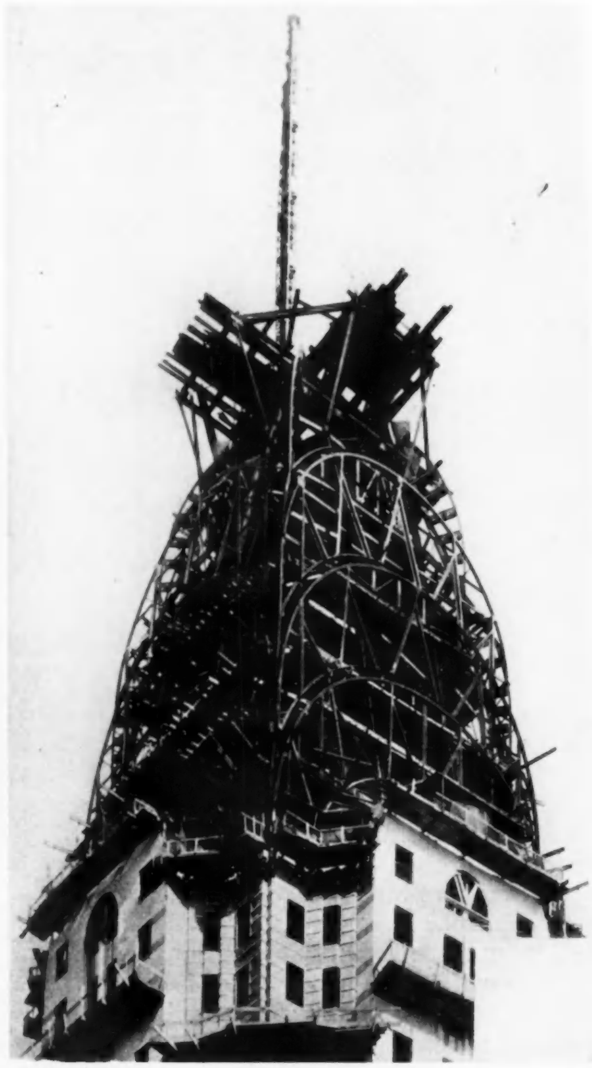
When it was decided that the topmost part of this building should out-top every other existing structure, it was necessary to resort to the unusual because of its after-consideration nature. Such problems are the especial joy of engineers and constructors. A high spire structure with a needle-like termination was designed to surmount the dome. This is 185 feet high and 8 feet square at its base. It was made up of four corner angles, with light angle strut and diagonal members, all told weighing 27 tons. It was manifestly impossible to assemble this structure and hoist it as a unit from the ground, and equally impossible to hoist it in sections and place them as such in their final positions. Besides, it would be more spectacular, for publicity value, to have this cloud-piercing needle appear unexpectedly.

The spire was fabricated and delivered to the building in five sections. The lowest of these was hoisted to the top of the dome and let down through an opening to the 65th floor level, where it rested on two 12 x 12 timbers, 20 feet long, placed on the floor framing. The other parts were placed in sequence and connected with the needle portion projecting above the top of the dome.

The derrick which raised these parts and after-



Heavy Truss Over the Lobby, Supporting One of the Tower Columns



Knickerbocker
Complicated Framework of the Dome. Curved Members Were Laid Out on the Mold Loft Floor at the Shipyard

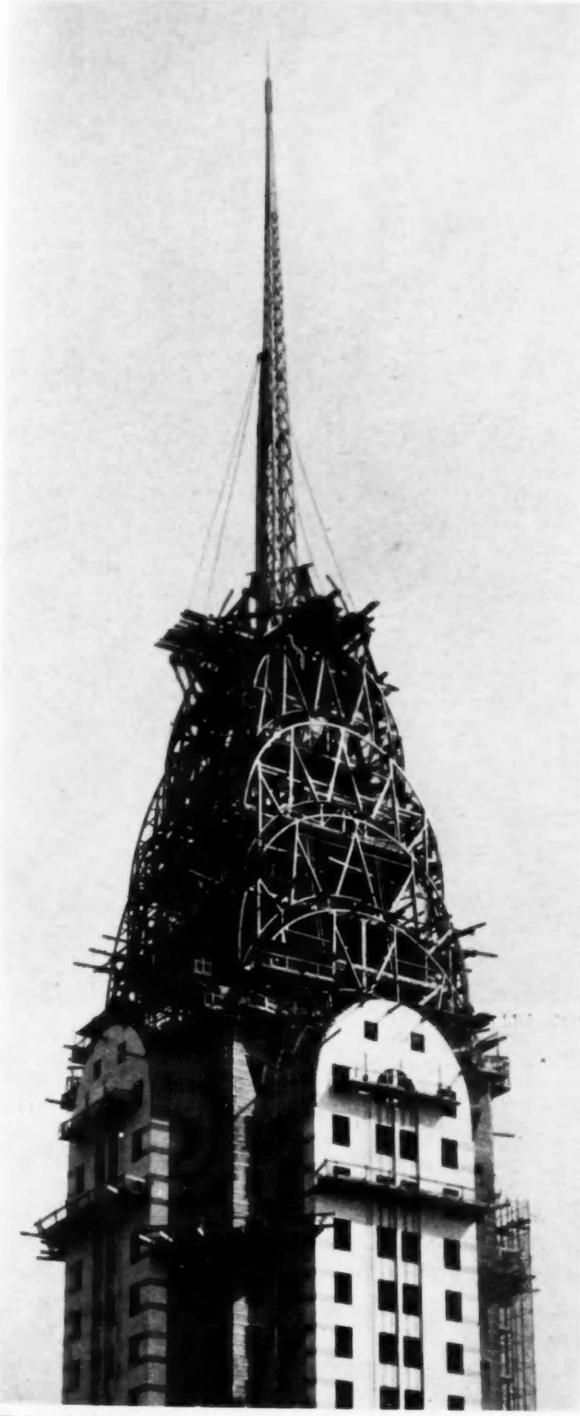
wards raised the spire to its final position was erected on one of the four sections of an outrigger platform built at the top of the dome. These also served as hitches for the derrick's guy lines. Although a 20-ton capacity derrick was used, it was capable of raising safely the 27-ton spire because the derrick mast was placed close to the opening at the platform level and the boom raised and held close to the mast, practically vertical. Derrick capacity is rated on its safe strength with the boom horizontal.

When the spire was finally assembled and riveted up securely, the fall lines were lowered and attached to the spire at its approximate center of gravity to prevent its tipping from a vertical position while being raised. The signal was given, and the spire gradually emerged from the top of the dome like a butterfly from its cocoon, and in about 90 minutes was securely riveted in position, the highest piece of stationary steel in the world. Post & McCord, steel contractors, and H. G. Balcom, consulting engineer, had finished their work,—the spire was in place.

EXTERIOR STEEL

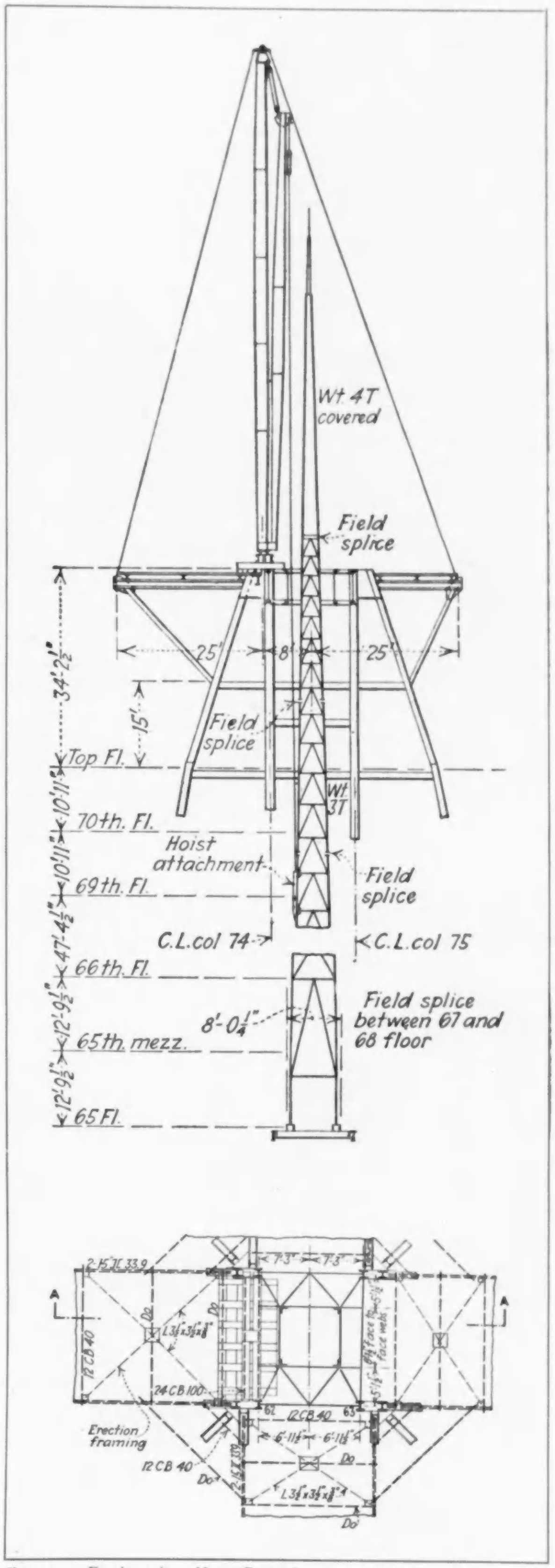
For the first time in this country, sheet steel was used extensively as an exterior finish on a building of the first class, as on the Chrysler Building. The chromium nickel steel, Nirosta, was a new product in this country, manufactured according to successful German methods. Owing to its particular physical properties, a designing and working technique had to be developed which the sheet metal contractors, Benjamin Riesner, Inc., successfully accomplished. The contractors fabricated the bulk of the work in two metal-working shops which were located on the 67th and 75th floors. The complicated and unusual formations of the dome made it advisable to fabricate the larger portion of the work in these shops, because it could be done only according to field measurements. Speed was maintained by this arrangement.

The principal use of the chromium nickel steel was on the dome, the spire, and the large gargoyles; it was also used on store fronts, main en-



Knickerbocker

The Spire Immediately After Being Raised from Within the Dome and Secured in Position



Courtesy Engineering News-Record

The Assembled Steel Frame of the Spire, Derrick and Platform at the Top of the Dome

trances and doors. The sheet metal covering for the needle or upper third of the spire was attached directly to the structural steel frame. A base of "nailing" concrete was provided for the sheet metal work completely covering that portion of the dome and spire below the needle, and extended down on both sides of the circular-head dormers to the 59th floor level. The sheet metal

ribs were fastened to fireproofed wood nailing strips placed on top of the concrete and fastened to the structural steel frame. Standing or lock seams, made without solder, were used throughout, except where they were impossible or undesirable, where soldered seams were used. The radial ribs on the fronts of the metal-covered dormers of the dome and similar ribbed construction are formed by sheet-metal-covered wooden battens. Contact between dissimilar metals was avoided by using Nirosta steel nails, screws, bolts, nuts and rivets for fastening the sheet steel in position. The entire work of the dome and spire was erected from a scaffolding made up of steel pipe and surrounded by heavy wire netting which gave complete protection to the workmen.

Two especially interesting examples of sheet metal construction are the gargoyles located at the 59th and 31st floor levels at setbacks in the exterior wall. Small scale models were made for studies, and, when approved, full size models were made to which the various pieces of sheet metal were fitted in the stamping shop. These full size models also served as a basis for designing the steel frames which support the gargoyles.

The gargoyles at the 59th floor level are in the form of an eagle's head and neck horizontal in position. They are very bold in outline, form and scale, and of proportions suitable for their great altitude. In the tops of these gargoyles

Rothschild

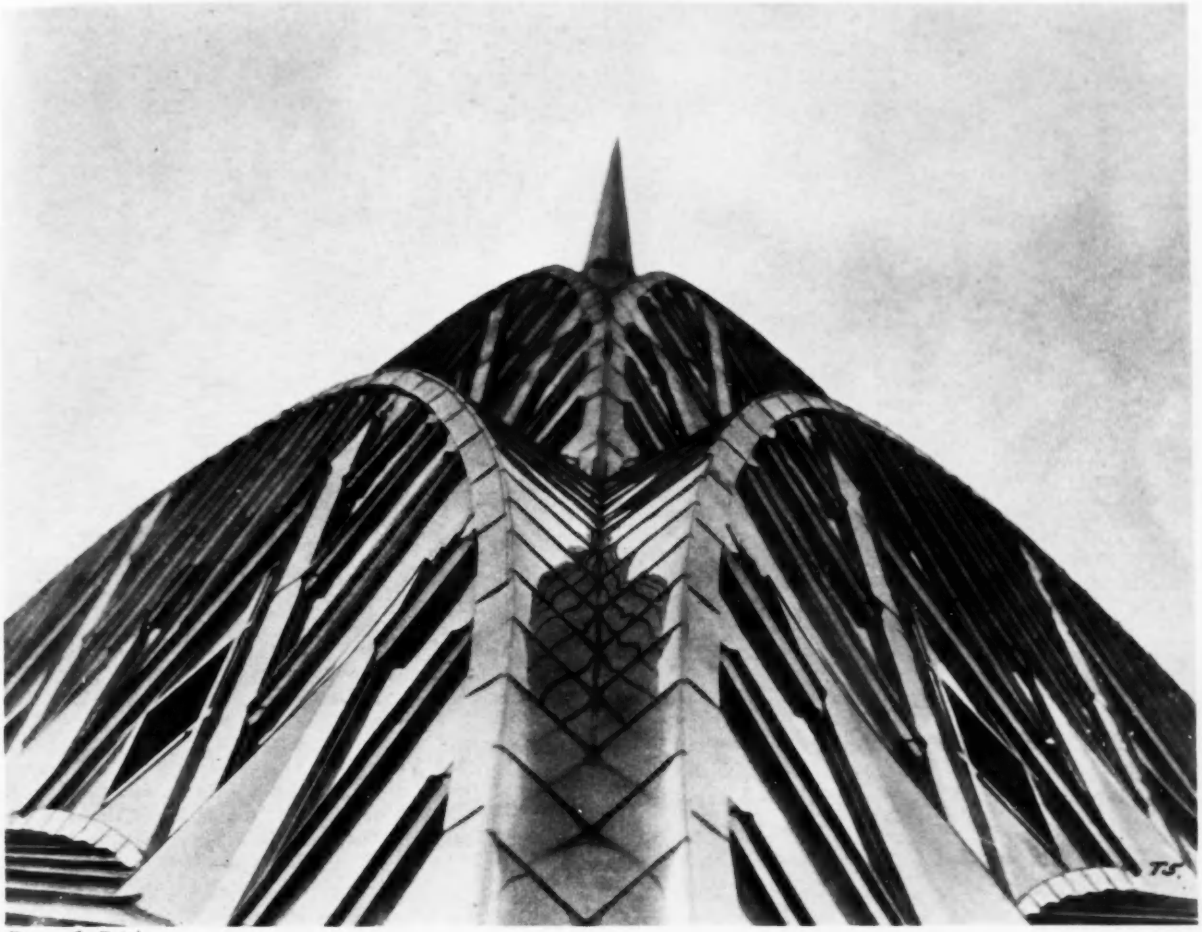
Rothschild

(Above) Gargoyle of Chromium Nickel Sheet Steel in Position at 59th Floor Level. Receptacle in the Top for Floodlights

(Left) Covering the Dome with Bright Sheet Steel. Note the Effective System of Scaffolding

depressed spaces are provided in which floodlight projectors can be placed. The gargoyles at the 31st floor level are in the form of the familiar winged radiator cap of the Chrysler automobiles. The wing spread of this gargoyle is about 15 feet. On the corners at the 24th floor setback are placed vertical pineapple sheet metal ornaments about 9 feet high.

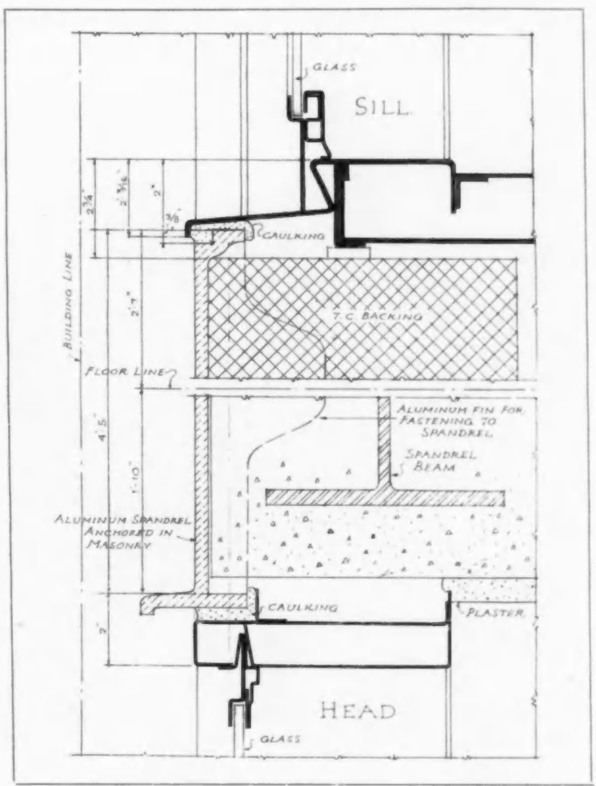
The other chromium nickel sheet steel work is not of what is generally called the sheet metal division of a building specification. It consists of metal doors and other more carefully fabricated parts which, liable to closer inspection, are of more accurate workmanship. In this division are included the steel work of the street store fronts; basement and lobby store fronts; frames and sash of the large windows in the lower stories; the main entrances and doors; frames of



Peyser & Patzig

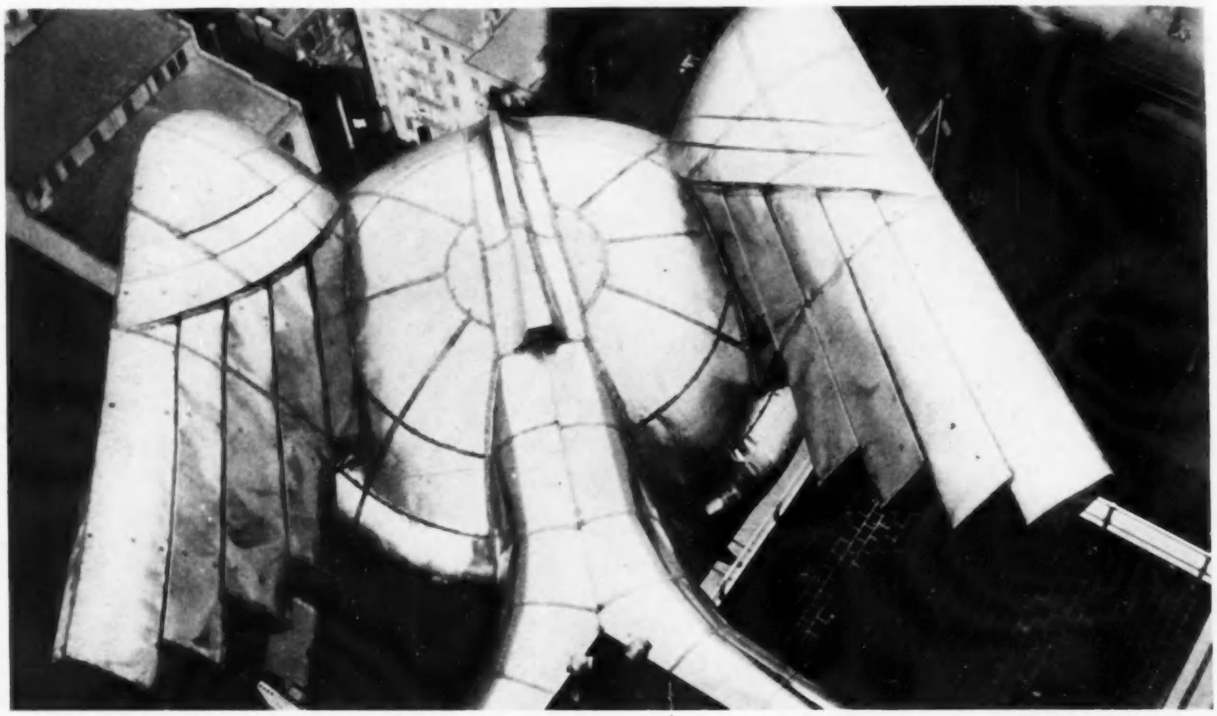
(Above) Unusual View of the Spire-Topped Steel Covered "Dome," Showing Batten Ribs

(Right) Detail of Cast Aluminum Spandrel Showing Head and Sill of Metal Window



bulletin boards; light reflectors and other items. These are made up of rolled shapes, tubes and formed sheets. The accuracy of their workmanship, and their finish and appearance are comparable to those of similar constructions made of other metals. Again the manufacturer, David Lupton's Sons, fabricated these items of a new material successfully.

The office partitions in the Chrysler Building are of steel made up in interchangeable sections so that the floor plans of any suite of offices may be changed quickly and conveniently, as may be necessary. The steel panels are packed with sound-proofing material and provision is made inside for carrying of wiring for telephone extensions, buzzer systems, electric outlets, etc. The finish of the steel is an exact photographic reproduction of choice walnut panels selected for their beauty.



One of the most interesting of cast aluminum window spandrels is in the Chrysler Building. These spandrels are located at the 20th, 21st and 22nd floor levels. Three designs were made, all of which were used on each floor. The relief portion of the spandrel is buffed to a bright surface, which makes the design clearly visible from the street level. The spandrel panels have lugs on the back which are bolted to steel lugs riveted to the spandrel girders.

Top View of the Chrysler Radiator Cap Gargoyle at the 31st Floor Level. The Nirosta Sheet Steel Parts Were Fitted to a Full-Sized Model in the Stamping Shop and Erected in Place at the Building

Interior View of the Chrysler Radiator Cap Gargoyle at the 31st Floor Level. Heavy Angle Iron Frame with Subsiding Bar Iron Supports for the Sheet Steel Work

WELDING STRUCTURAL STEEL TODAY

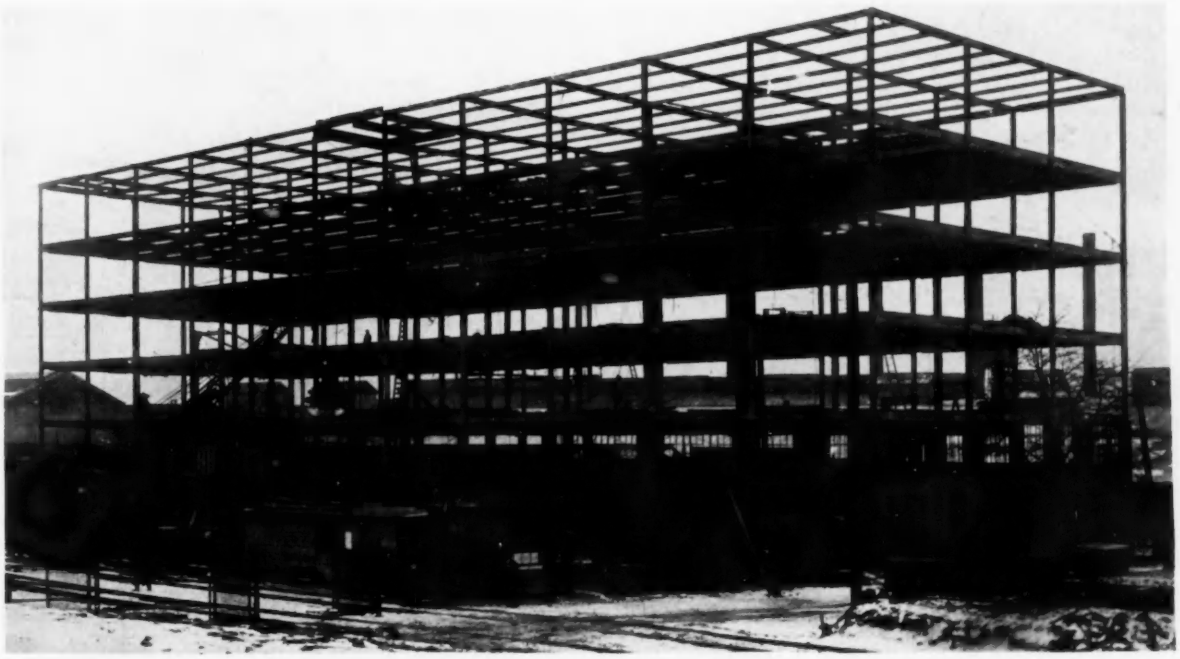
BY

A. T. NORTH

FOUR years ago a five-story, all-welded steel frame warehouse was erected at Sharon, Pa., by the Westinghouse Electric & Manufacturing Company. It is a 790-ton structure. The construction of this building attracted much attention not only on account of its size but also because it included the first all-welded plate girders. It was this building that gave the great impetus to the scientific and economic consideration of the possibilities of welding structural steel. A prediction was made that within ten years the welding of structural steel frames would be in general use in this country. We develop rapidly everything that pertains to building construction in this country, and it is well to ascertain the condition of the art of welding as it exists today.

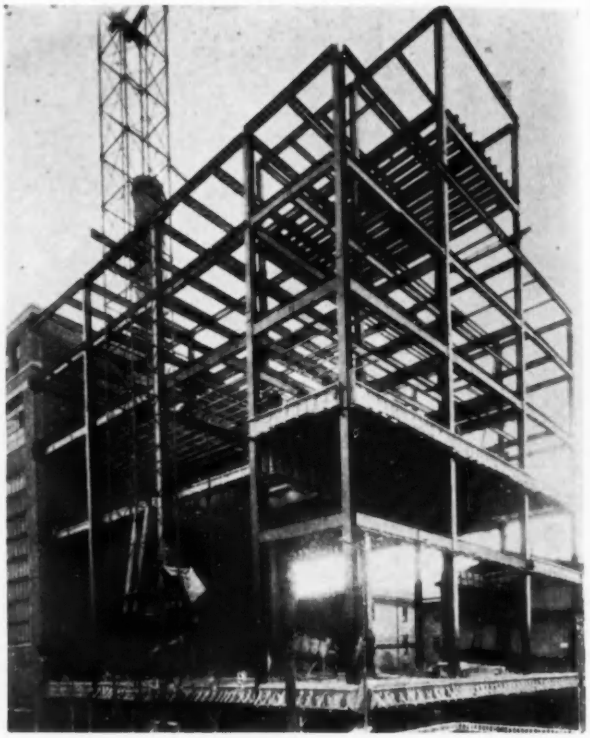
At the time mentioned, the American Bridge Company became active in designing, fabricating and erecting structural steel frames for buildings, and it has been and is an important factor in everything pertaining to that type of construction. Under the able direction of the late James Harvey Edwards, chief engineer, a design, fabrication and erection technique for welded construction was developed for that company. From the first, the Westinghouse Electric & Manufacturing Company, the General Electric Company and the Lincoln Electric Company adopted welded steel construction in their own new buildings,—an evidence of their faith in the method and serving as a practical laboratory for the development of all the phases of the art and the training of competent welders.

The American Welding Society was the proper organization to study the problem and establish standards for welding structural steel, a comprehensive program for which was initiated during the administration of its former president, Frederick T. Llewellyn. An important feature of the Society's work was the promulgation of a proposed building code requirement for welded steel construction. This code has been adopted by 83 cities and towns which have incorporated provisions for welding in their building codes, using the permissible unit stresses recommended by the American Welding Society in its code for welding steel building frames. Another activity of the Society was in correlating all available data and



The First Important and at the Time the Largest All-Welded Steel Frame Was the 790-Ton Frame Erected at Sharon, Pennsylvania, November, 1926, for the Westinghouse Electric & Manufacturing Company

The 3,000-Ton, Shop-Riveted, Field-Welded, Steel Frame of the New Southern California Edison Building, Los Angeles, California



The Shop-Riveted, Field-Welded Frame for the Extension to Power House for the Haddon Hall-Chalfonte Hotel, Atlantic City. Guests Not Disturbed

determining what constitutes a satisfactory technique. It was necessary to discover the nature of a weld, the characteristics of the different parts and zones of a weld, and the effect of the process, if any, on the materials involved,—the histology, if you please, of a weld.

STRENGTH RESEARCH

Many tests were made at various laboratories, including that of the U. S. Bureau of Standards, to determine the strength of welds and to observe their behaviour during the tests up to the point of failure. As a result of all this research work and the observation of the construction of a large number of buildings of all kinds, the art of welding structural steel has become a safe and economical type of construction. The rapid progress in welding was possible because of the known and uniform quality of the material involved, structural steel.

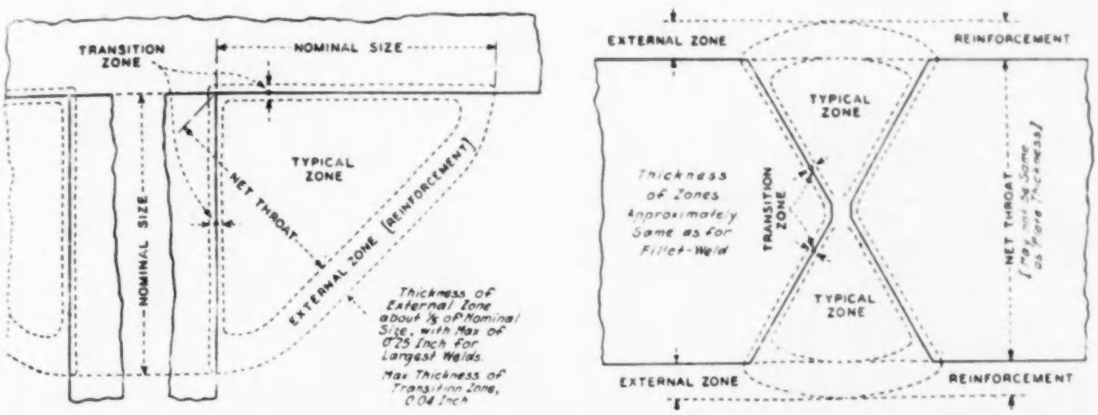
EFFECT ON BASE MATERIAL

The effect of welding on the strength of the base material has been thoroughly investigated. In a paper presented to the American Iron and Steel Institute, May, 1927, Mr. James H. Edwards states that: "One of the questions raised is what effect if any does the welding process have on the strength of the base material? It is generally conceded that for joints of ordinary thickness, when the steel has a carbon content below 0.25, there is no appreciable change in the strength of the parent material." This is important.

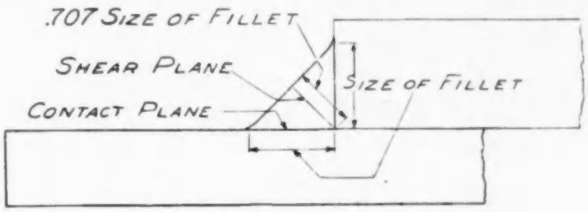
Mr. F. T. Llewellyn, August 29, 1930, states that: "When tested to destruction, a welded joint usually breaks two or three times the thickness of the parts away from the weld. This is not due to crystallization. The effect of the process is rather to slightly anneal, or normalize, the base metal, thereby causing it when loaded to stretch and neck to a reduced area before the weld itself is fully stretched. This necking is augmented by the fact that, whereas the yield point of ordinary steel is about 35,000 lbs. per square inch, the yield point of weld metal is about 40,000 lbs.

"Thus, instead of crystallizing the adjacent metal, welding makes it more ductile. The net result is a joint that frequently outpulls the base metal, and never falls below its strength by the amount lost in other fabricating processes as a result of punched or drilled holes."

In Research Paper No. 161, Bureau of Standards, the results of tensile tests on electrically welded steel tubing are found to be that: "These strengths did not indicate any zone of weakness near the weld." These opinions are similar to that of Mr. Andrew Vogel, Engineer-in-Charge, Plant Engineering Department, General Electric Company, who states (September 3, 1930,) that: "Although I have made or supervised over 200 tests on welded specimens or structures, I have yet to note any tendency to failure in the parent metal



The Characteristics of the Fillet-Weld (Left) and the Butt-Weld for Thick Plates (Right) as Described by Llewellyn



The Fillet-Weld as Described by Vogel

immediately adjoining the zone of fusion. Practically all of the tests failed by shear on the 'shear plane' through the minimum section of the weld metal. This was, of course, exactly as intended, as the welding was designed to fail on all test specimens, as a general rule, in order to find out the physical strength of the weld.

"In the test specimens where the weld was designed to develop the full strength of the member, the member invariably failed without disturbing the welding. I have not observed any weakness between the weld metal and the parent metal which would affect the structure as a whole. The contact plane between weld metal and parent metal is larger than the shear plane through the minimum section of the weld metal and, therefore, if the unit stress value at the contact plane should be slightly less than the unit stress value on the shear plane, the shear plane would fail. Apparently there is no way of determining the relative unit stress value of contact plane and shear plane, but as long as the total stress value of contact plane is greater than total stress value of shear plane, the exact relative unit stress values are of little practical concern."

PHYSICAL CHARACTERISTICS

The physical characteristics of a weld are described by Mr. F. T. Llewellyn in a paper presented to the American Iron and Steel Institute, October, 1928: "If the base metal is mild steel, regardless of grade of wire or welding conditions, the weld is found to contain three zones, which always occur in the same sequence and with constant characteristics: (1) a transition zone at the contact surface of weld and base metal; (2) a typical zone in the body of the weld; and (3) an external zone in the outside layer of the weld.

"At this time we will consider in detail only the transition zone adjoining the base metal. In extent this zone never attains a thickness of one millimeter, and only from two to three-tenths of its thickness are occupied by the portion in which there is interpenetration of base and weld metal. This zone is sometimes invaded by impurities from the base metal, but no impurity in the weld metal ever penetrates beyond the transition zone into the base metal. These facts are established by many microscopic analyses. Therefore any effect of the welding operation on the base metal beyond must be merely a thermal one. We will consider such thermal effect after giving a summary of the characteristics of the transition zone itself.

"Micrographs show that the transition from base to weld metal is marked by a reduction in grain-size, that is to say by a refining effect, but it is also sometimes accompanied by more slag inclusions than occur in other portions of the weld. In welds properly made, with good wire, these inclusions are too minute to be visible to the naked eye and should not be considered as serious defects. They do mean, however, that the metal in this zone is not always as strong (per

McAnally

The Dallas Light and Power Building, 19 Stories High, All Shop- and Field-Riveted, Approximately 1,225 Tons, Surrounded by Hotels and Office Buildings. Details Below

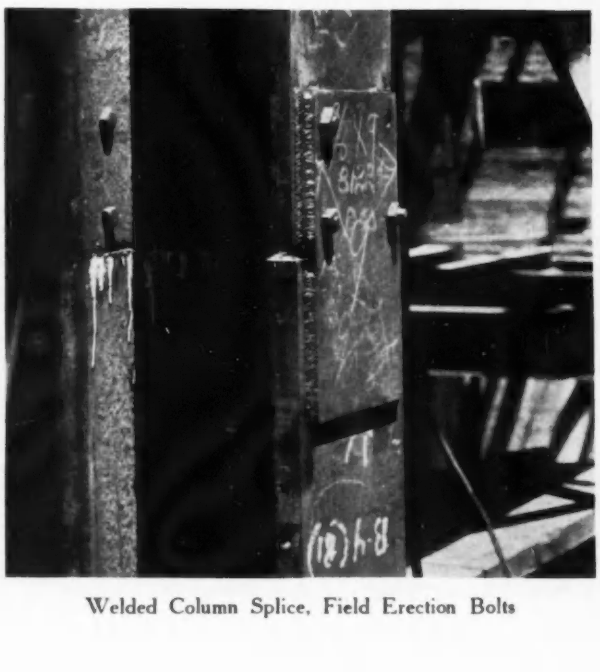
unit) as that in the body of the weld, by an amount that never seems to exceed 30 per cent, and is generally very much less.

"This weaker zone should be, and in current practice is, compensated for by providing contact surfaces that are greater than the critical throat dimensions. In the case of important butt welds, additional area is secured by bevelling the edges of the base metal, thereby giving to the weld a V form. In the case of triangular fillet welds, no such preparation is needed, for the reason that the ratio of the leg of an isosceles right triangle to the normal to its hypothenuse is happily greater than is required. This is one reason why a fillet form of weld is to be preferred in most structural work. It eliminates the cost of bevelling."

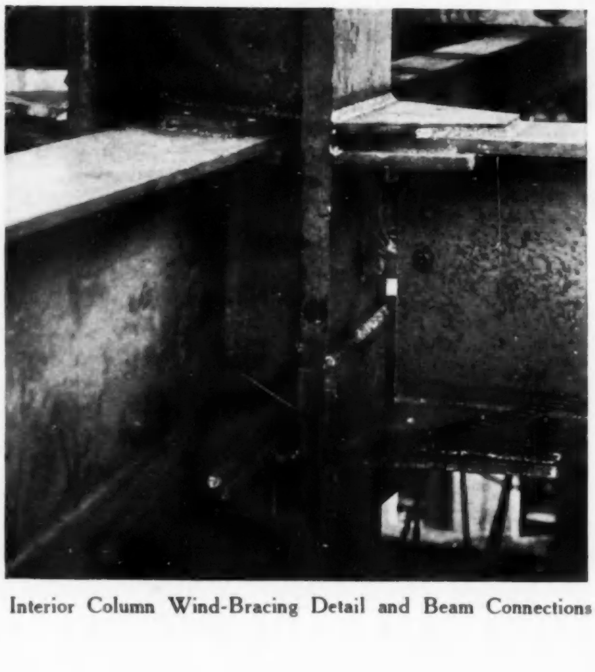
SHOP AND FIELD INSPECTION

The inspection, both shop and field, of the ordinary types of construction is well standardized and reliable. Objections are made by some persons to welded construction on the supposition of the inability of the inspector to determine the strength quality of the weld by visual inspection alone. It is needless to say that the most serious consideration has been given to this phase of the matter. An inspection technique has been developed by observing tests, and it is reliable, contingent like *all* kinds of inspection, on the ability and honesty of the inspector. Professor H. C. Berry, University of Pennsylvania, under date of August 13, 1930, expresses exactly the accepted thought of the most experienced and skillful welding experts which can be accepted as proved by experience:

"We have tested one hundred and twenty coupons, welded in two positions, vertical and hori-



Welded Column Splice, Field Erection Bolts



Interior Column Wind-Bracing Detail and Beam Connections

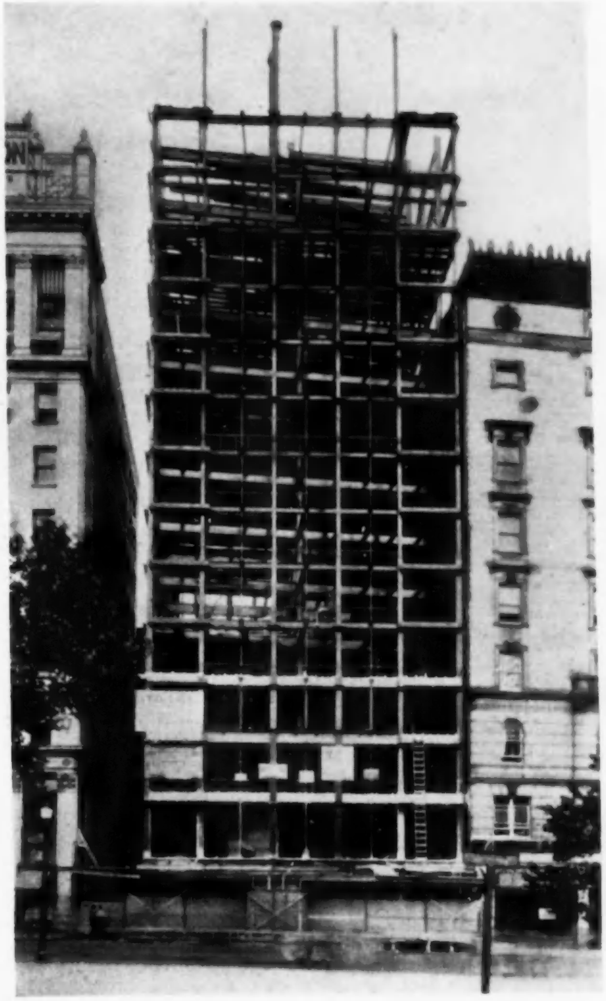
zontal, by five different men. A general examination gives the impression that welding is really a safe method of fastening two pieces together.

"As to a desired method of testing welded work, it has been my dream that the electrical engineers will ultimately develop some form of instrument which will permit the inspector to use two steel bristle brushes attached to leads from the instrument, so that he may rub them along opposite sides of the weld and obtain a reading proving the presence or absence of perfect contact. It seems that this can not be expected soon. Mr. Frank P. McKibben, Consulting Engineer, General Electric Company, said that their operators and inspectors are able to tell from the appearance of the weld whether it is satisfactory or not. To my mind, this is, on the face of it, an unsatisfactory situation for the industry; but, after testing the one hundred and twenty joints in one day (August 9th), I began to feel that his statement is positively true, that one practiced in welding and dealing with welds can select the low-strength weld every time; that is, the flow of the metal from the electrode, the presence of oxide or 'burn,' and the depth of the fillet, to the trained observer, are indications of the weld.

"I regret that I have no hint leading to a satisfactory method of testing welded joints that would be free from the personal factor of the inspector, but I do not believe that this condition should be a real deterrent to the development of the welding industry."

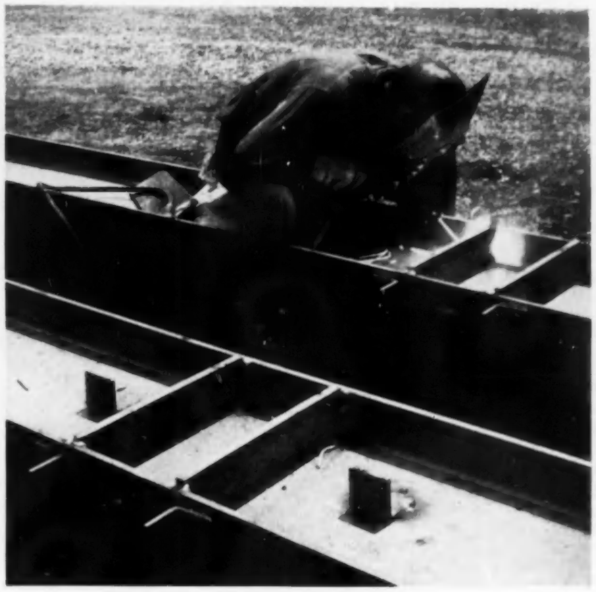
INSPECTION METHODS

Three methods exist for examining welds in addition to visual inspection—X-ray, magnetic or electric resistance, and stethoscope. But while

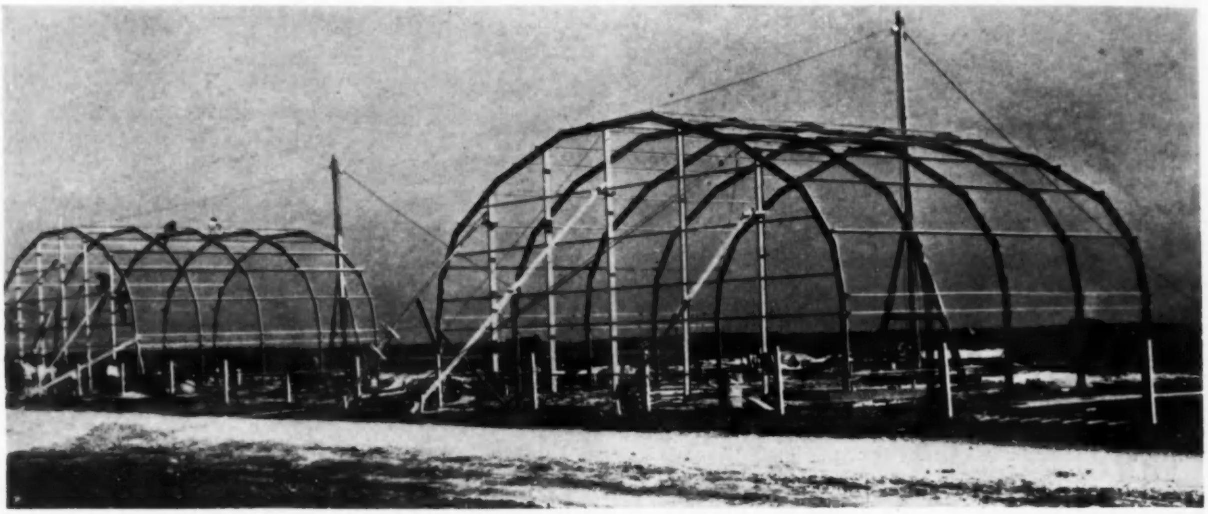


Office Building for the Edison Electric Illuminating Company, Boston, 14 Stories High, 1,400 Tons, Shop-Riveted and Field-Welded

Minimum Detail Material



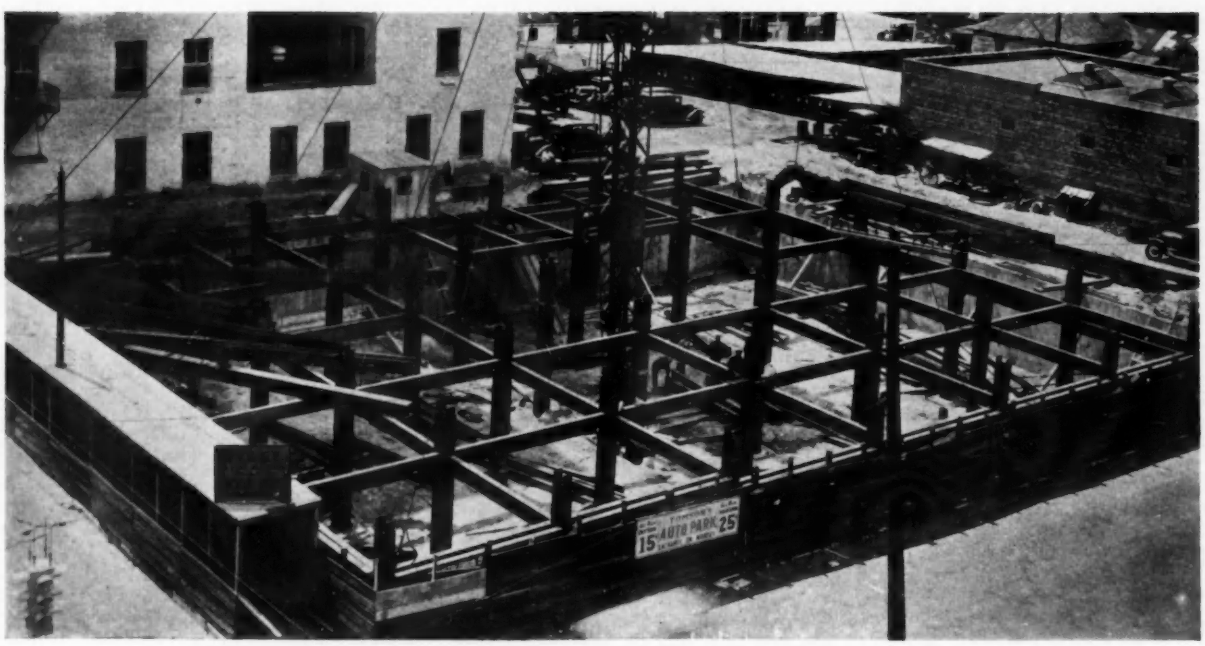
A Welder at Work



All-Welded Frame for the Houston Airport Hangars. In Background Are Several Motor Trucks with Gasolene Engine-Driven Electric Generators

these are useful for studying the nature of weld metal, even to the extent of revealing internal flaws, and of assistance in establishing proper procedure control of welding technique, which is, of course, important, they have not been adopted for inspecting welded joints in buildings.

Mr. Frank P. McKibben bases the inspection of welds on three readily distinguishable characteristics: (1) The hypothenuse or exposed face of the weld must be a straight line and not depressed. A depressed or concave surface on the exposed face of the weld reduces the intended strength of the weld because of the lack of weld metal on the shear plane, a basic factor in the design calculations. (2) The joining of the edges of the weld to the base material must be a complete "feather edge." A rounded edge of the weld where it joins the base metal indicates an incomplete fusing and amalgamation of the base metal, causing a reduction in the size and strength of the weld at the contact plane. (3) There must be no minute, head-like globules of metal on or adjacent to the weld nor gas holes or depressions in the welding metal. This indicates that the welding instrument was not held in the correct position or that an improper current was used.



Dallas Gas Company Building, to Be Shop- and Field-Welded. Designed for 22 Stories, of Which 14 Stories Are Under Construction. 1,000 Tons of Steel

Houston Airport Hangars. Welded Steel Frame, Corrugated Iron Covered, Rigid, Strong, Fireproof and of Moderate Cost

The competent inspector has been taught, by observing tests of welds and comparing the strengths with the appearances, to recognize the quality of the weld. The visual inspection of lumber is based on the same methods, and the expert can determine accurately the grade, quality and strength of the material.

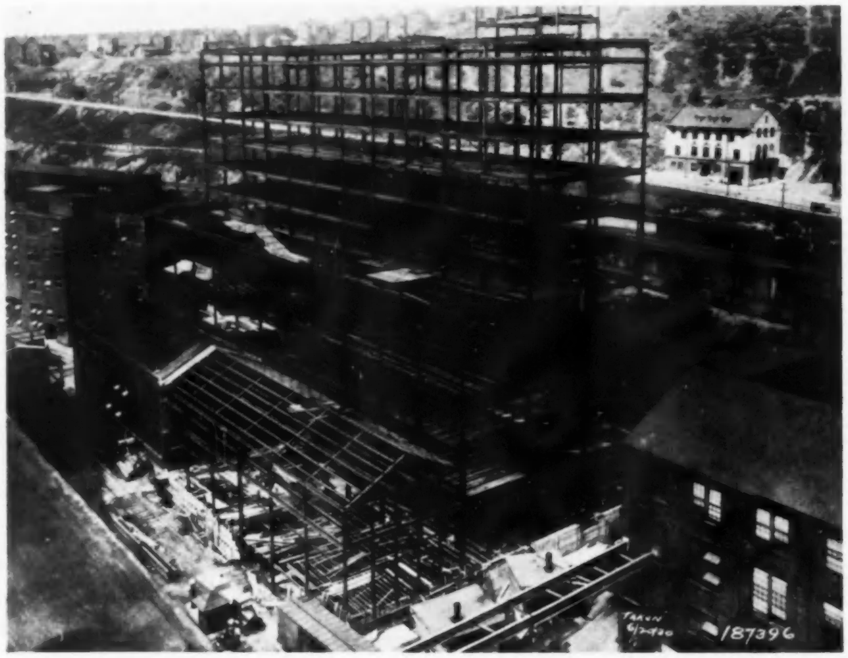
DESIGNING CONNECTIONS

Standard welded connections have not been developed in the sense of a "handbook" method of construction and may not be. Structural engineers and fabricators who have become proficient in designing welded construction merely apply certain fundamental principles to the designing of each connection as the conditions may require. It is not a field of exploitation for "handbook engineers." There is, however, every indication that competent engineers, fabricators, welders and inspectors are available for the demands.

WELDED BUILDINGS

No accurate census has been made of the welded structures in this country. The indications are, however, that considerably more than one hundred buildings have been so constructed. This is not an imposing number compared with the total number of steel frame buildings erected during the past four years. The especially significant facts are the increasing size and importance of

All-Welded Plate Girders to Support the Upper Bearing Bracket Form 19,000 KVA Waterwheel Generator. Note Absence of Connection Angles



Central Engineering Laboratory of the Westinghouse Electric & Manufacturing Company, East Pittsburgh. 2,000 Tons of All-Welded Steel, 11 Stories High, 222 Feet Long by 120 Feet Wide

welded structures and their wide distribution throughout the United States. Also the character and importance of the owners are an indication of the attitude of careful and conservative investors toward the method.

Eighty-three cities and towns have included welding regulations in their building codes, and a large number of them have made special rulings permitting its use. Radical revisions in building codes are made slowly, but the progress made at this time indicates that the adoption of welding regulations will be in step with the engineering, fabricating and erecting facilities that are available. Like other important changes in construction methods, welding has met with expected opposition from all of the factors involved, but the opponents are recognizing the inevitableness of welding and are beginning to prepare themselves for the new method.

FACTORS FAVORING WELDING

Three factors will ultimately force the universal adoption of welded steel construction. Economics of construction always exerts powerful influences on design and use. The reduction in the tonnage of steel by the use of welding, instead of riveting, is considerable, varying with the type of details and construction. The labor cost of welding is becoming less with the improvements in welding apparatus and the greater experience of the mechanics. Another economic feature pertaining to steel construction is the effect of the noise of riveting on those within hearing distance. It is acknowledged that the noise of riveting reduces the efficiency of workers, regardless of the nature of their work. The noise of riveting structures near hotels, hospitals, apartment houses and office buildings tends to reduce the profits of operation, for obvious reasons. The effect of noises on health primarily, indirectly on efficiency, is being investigated by health authorities, and the intention is to eliminate all noises that can be avoided. The certainty that welding structural steel, both in the shop and field, is safe and conforms to established engineering principles and practice and has had an unbroken, successful record for strength and security, justifies health authorities to exercise their police power in requiring that structural steel shall be welded. The practicability of welding structural steel is evidenced by the recent statement of the chief engineer of one of the world's largest steel fabricating corporations to the effect that his company "would undertake to design and construct a *completely* welded structural frame for buildings of any size or tonnage." The experience of this corporation justifies its faith.

Fortunately the development of welding methods has been conducted by careful and painstaking persons, no errors have developed and no unsatisfactory experiences are recorded. With the advent of every new construction method there are certain pioneers to whom credit is due for progress and successful performance. In addition to the American Welding Society and the corporations of which mention has been made, credit is due for notable contributions to the art by James H. Edwards, Gilbert D. Fish, J. F. Lincoln, Frederick T. Llewellyn, Frank P. McKibben and Andrew Vogel. Numerous welding contractors have contributed also to the development of the method.

THERMAL INSULATION IN BUILDINGS

BY

ROGER W. SHERMAN

THERMAL insulation in buildings exists as an aid in the development and maintenance of maximum comfort. This analysis may be synthesized into components, for insulation is practically employed for three reasons:

(1) To reduce heat losses from buildings.
(2) To maintain interiors at even temperatures.
(3) To reduce fuel consumption in heating plants.

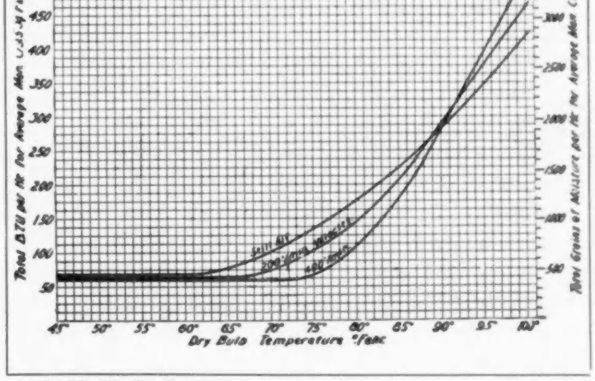
These considerations presuppose the existence of a sufficient heat supply; of an adequate system of ventilation and of proper humidification of air; and the insulation of buildings is important only as it affects a development in differential criteria of these factors. No all-inclusive rules of insulation methods may be set down. Every case involving the use of such methods involves also the questions of cost, time and space which are peculiar to the specific problem. Ultimate efficiency of thermal insulation as regards method and material can be stated only in relation to these factors. The scope of this paper, therefore, constitutes a compilation of governing principles, a notation of certain practical facts, and an estimate of the subsequent value of thermal insulation methods.

I. OPTIMUMS IN BODILY COMFORT

The process of metabolism in the human body generates heat which, for health, must be eliminated by radiation and evaporation. Since human comfort depends in a large degree upon sensations of warmth or coldness, and since the loss of bodily heat is affected by the factors of temperature, air motion and humidity, there must exist certain combinations of these factors to produce ideal conditions for eliminating natural body heat. The body in a state of health maintains an average temperature of 98° Fahr. Interior temperatures ranging from 60° to 75° Fahr., and relative humidities from 30 to 60 per cent are those at which people feel most comfortable, the degree depending upon the physical activity of normally clothed individuals. The psychological factor of physically proper air conditions is important. Physical comfort, as related to the elimination of metabolic heat, lessens nervous tension, promotes mental activity, and greatly increases the benefits of rest and relaxation. The loss of heat from buildings tends to change the optimum condition, and methods to reduce this loss and to maintain a constant temperature within comfort limits are valuable.

II. TRANSMISSION OF HEAT

The transmission of heat through material is accomplished by radiation, conduction and convection. After overcoming surface resistance, heat comes in contact with a material and passes through it to radiate in reduced intensity on the opposite side. In general, the density of materials is an influential factor in the ease and speed of this passage. In a homogeneous material, such as steel or glass, one surface becomes heated by convection and the heat penetrates quickly to the other surface by conduction, or a molecular transfer of heat energy. In porous materials, such as cinder block, the heat passes slowly through the material by a successive combination of convection, conduction and radiation between the air spaces and particles of matter within the material itself. The best heat retardant is a vacuum, for in it there exists no matter to radiate or conduct energy, and no medium to establish a flow of convection currents. The next best is a gas, such as air, in a completely still or dead state. A vacuum



A. S. H. V. E. Guide

Fig. 1. Relation between heat and weight loss from the human body by evaporation and dry-bulb temperature for still and moving air

Weber

Massive construction, cheap fuel for a simple type of heat, and confined conditions of use make heat insulation relatively unimportant. In structures of this kind the materials themselves and the method of construction tend to reduce heat losses through walls and roofs

is a practical impossibility in buildings and, due to convection, a simple air space between two walls is not a still one. Theoretically, an insulating material is a substance that will prevent the transmission of heat by minimizing the effects of conduction, convection and radiation. Practically, the best heat insulators follow theory closely and approach in their structure the theoretical criterion. Rock wool, for example, is composed of minute fibers tending to lessen radiation and conduction by a contact resistance at various points and to minimize convection by the formation of small and comparatively still air cells between them. A pressure that promotes a closer contact of particles and destroys the air cells, or an absorption of moisture that greatly increases the possibility of conduction tends to lessen the insulating value of a material. Pyrex glass is a good heat conductor, but when made into glass wool becomes an efficient insulating material, and hair felt or other fibrous material is a poor insulator when wet.

The resistance to heat transmission of a particular material is expressed as a statement of its thermal conductivity. This is a property of the material itself and is defined as the amount of heat,—expressed in British thermal units (B.t.u.), one unit being the amount of heat necessary to raise one pound of water 1° Fahr.—which will flow through a 1-inch layer of the material 1 square foot in area, per hour, for a difference in temperature of 1° Fahr. between the faces of the material.

This property is without regard for size, shape or method of installation. The lower the conductivity, the greater the insulating value. Thermal transmission, however, applies to constructions. It is measured by an overall coefficient of heat transmission showing the amount of heat, expressed in B.t.u., transmitted per hour through 1 square foot of the entire construction for a 1° Fahr. temperature difference between the air on the inside and outside of that construction. As above, the smaller coefficients indicate a great resistance to heat transmission.

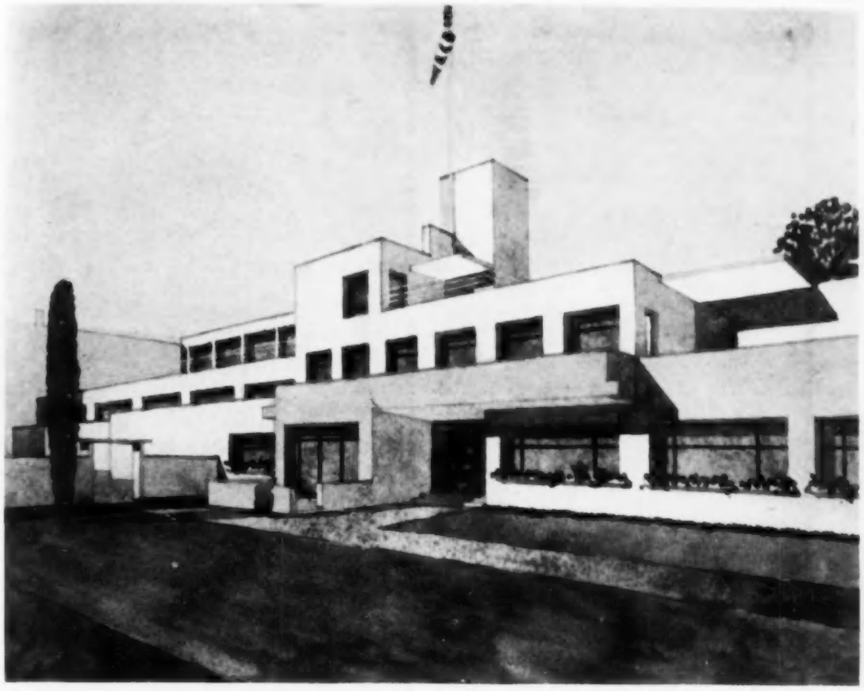
III. TYPES OF INSULATING MATERIALS

Materials in commercial use as heat insulators may be divided into three general types:

(1) *Loose.* This includes (1) fibrous and powdered products, as rock wool, ground cork, etc., that are packed or blown into open spaces in constructions; (2) those in a powdered form that are mixed with water and poured into structural enclosures, forming a rigid, cellular composition, and (3) flaky materials that are mixed with a binder and are blown on structural members to form a solid covering.

(2) *Flexible.* Under this heading are—(a) *Quilted Materials,* made by the inclusion of various fibers between sheets of cloth or paper to form a blanket, and (b) *Felted Materials,* made in sheets of matted fiber without a covering.

(3) *Compact.* This covers (a) *Semi-rigid* materials of loosely pressed mineral or vegetable



Bonney

A light construction with open conditions of use makes the use of thermal insulation a necessity. Much heat is lost through flat roofs and thin walls. The use of expensive fuel in complex heating systems makes the conservation of heat an important factor in economical operation. Mallet-Stevens, Architect

fibers either in blocks or sheets, and (b) *Rigid Boards* usually with considerable tensile strength for use as a structural, as well as an insulating, unit. Boards are generally of a heavier density than many other types and, though their conductivity is somewhat higher, they are useful building materials.

Table I shows a list of thermal conductivities of some typical insulating materials. In some cases variation from laboratory tests may be discovered in field tests of materials in commercial form, but for all practical purposes such variation is unimportant. In general, and from the standpoint of insulation alone, the lighter the weight of material per unit volume, the better it is as an insulator per inch of thickness; and the thickness in application of products having cellular or fibrous characteristics is an important factor in insulating efficiency.

The relative efficiency of all products, however, depends upon the method of their employment in various constructions. Materials which in themselves are good insulators will not develop their proper efficiency unless the directions of manufacturers, which are based on complete tests, are implicitly followed. Sweeping general statements regarding great reductions in heat loss as increased percentages in the saving of fuel and square feet of radiation are often misleading and are valuable only as they refer to specific instances, and only in direct relation to the determinants involved.

IV. SELECTION OF INSULATION MATERIALS

The choice of insulation materials depends on (1) the type of building, (2) type of heating, ventilating or air conditioning, and (3) relative cost of installation.

A. *The type of building* is directly influenced by its use and location. In many cases, exclusion of heat may be more important than the prevention of its loss. The difference between insulation for heat and insulation for cold is in the point of view regarding change of interior optimum conditions, and the same type of insulating material might be employed for both considerations, though the method of application might differ in specific cases.

B. *The type of heating, ventilating or air conditioning.* Types of heat divide into (1) convected heat, as supplied by the usual radiator, and (2) radiant heat such as the English panel system. For the former, insulating materials should be chosen for resistance to conduction and radiation resulting from contact with convection currents. With radiant heat,—installed either in the walls or ceilings,—insulation becomes less a problem of preventing filtration than one of the prevention of heat transmission, and insulation for walls and roofs is relatively more important than for window and door openings. The insulation of buildings containing a ventilating or air conditioning system is a general problem. The heat may be either radiant or convected, and, due to

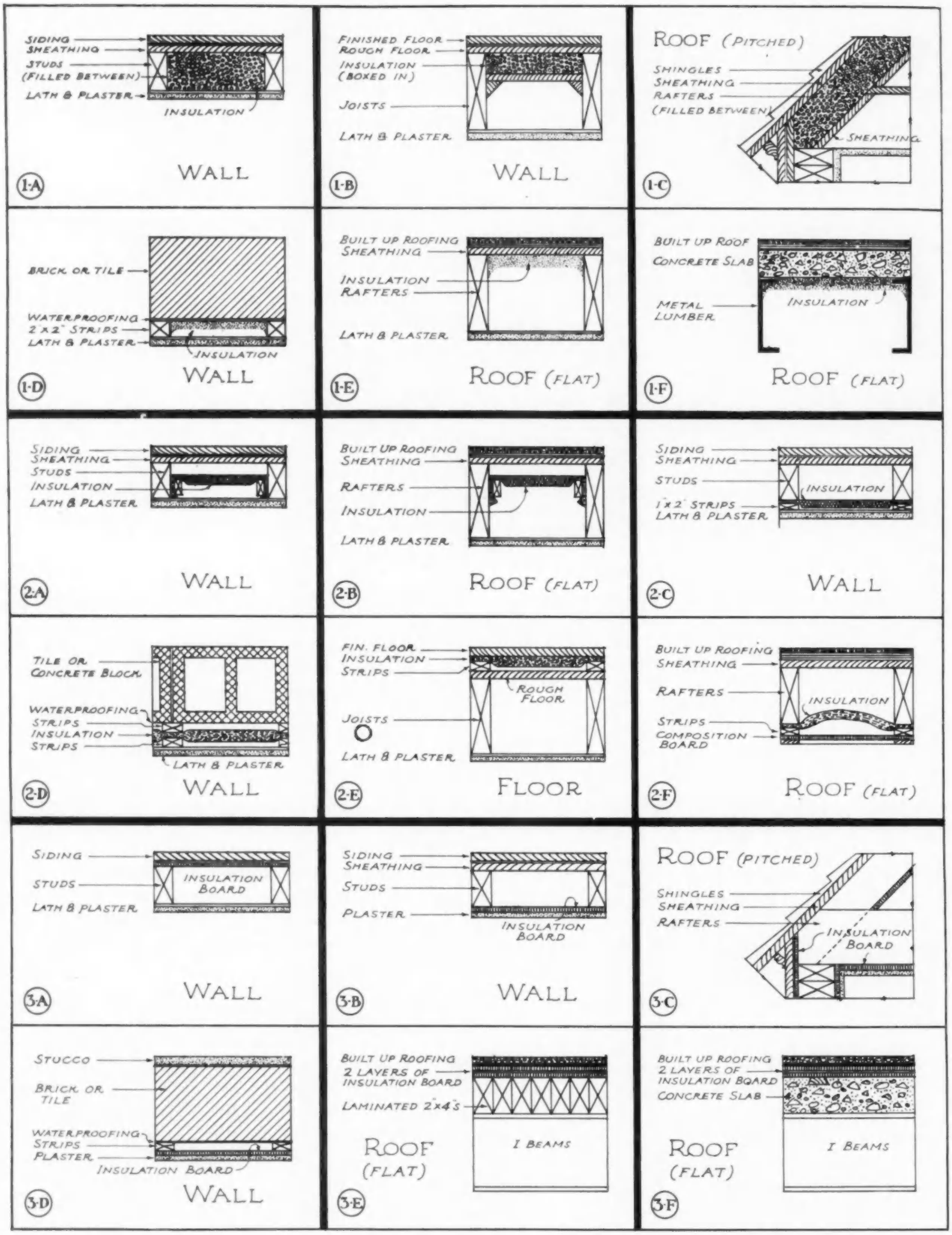


Fig. 2

Group 1 illustrates the use of a loose type of insulating material in both frame and masonry construction. Group 2 relates to the use of flexible materials, and Group 3 shows the board type of compact materials in generally similar constructions. Many installations of heat insulation materials are efficient also as structural materials, and many others may be used in methods of soundproofing

the constant circulation of air, much is lost by both transmission and filtration. Insulation against conduction and radiation in walls, floors and roofs, and for lessening filtration, invariably increases the effectiveness in operation of mechanical units.

C. *Relative cost of installation* of materials is a function of their type, efficiency in use, method of installation, and consequent savings in building maintenance. Since specific problems vary so widely, it is not possible to assign a cost to insulation without a close and accurate estimate of conditions changed because of its use: (1) increase or decrease in floor area and dead load; (2) additional labor involved in installation; (3) time in relation to other trades and the project as a whole; (4) the possible savings in fuel and (5) possible decrease in heating apparatus required relative to type of fuel and method of heating. Cost per square foot of insulating material means but little in itself, and though certain estimates regarding fuel savings may be generally true from a particular outlook, a most careful analysis of all relevant details must be made if an ultimate value of thermal insulation is to be stated.

V. HEAT LOSSES FROM BUILDINGS

Heat losses from buildings are governed by these several factors:

1. *Location and climate.* Questions of orientation, temperature range, relative humidity and wind velocity are factors of importance.

2. *Type of construction and workmanship.* This relates to choice of window types, wall, floor and roof materials, selections being governed by conditions of cost and use.

3. *Conditions of Use.* In buildings where the openings are in continuous operation, a greater heat loss will occur than in those which are sealed over periods of time.

4. *Type of heat.* More loss is generally occasioned by convected heat than by radiant heat, regardless of the mechanical source.

Heat is lost from buildings in two ways,—(1) by transmission through the construction, and (2) by filtration through cracks and clearances around openings and through porous structural materials. In many cases, dependent on the difference between interior and exterior pressure, infiltration of cold may replace the exfiltration of heat through cracks, etc. This constitutes a heat loss, since the use of additional heat is required to bring such infiltration to a desired interior temperature.

A. *Loss by transmission* occurs through walls, floors, ceilings, roofs, doors and windows. General percentages of loss through these components are useless, for they are dependent on the extent,

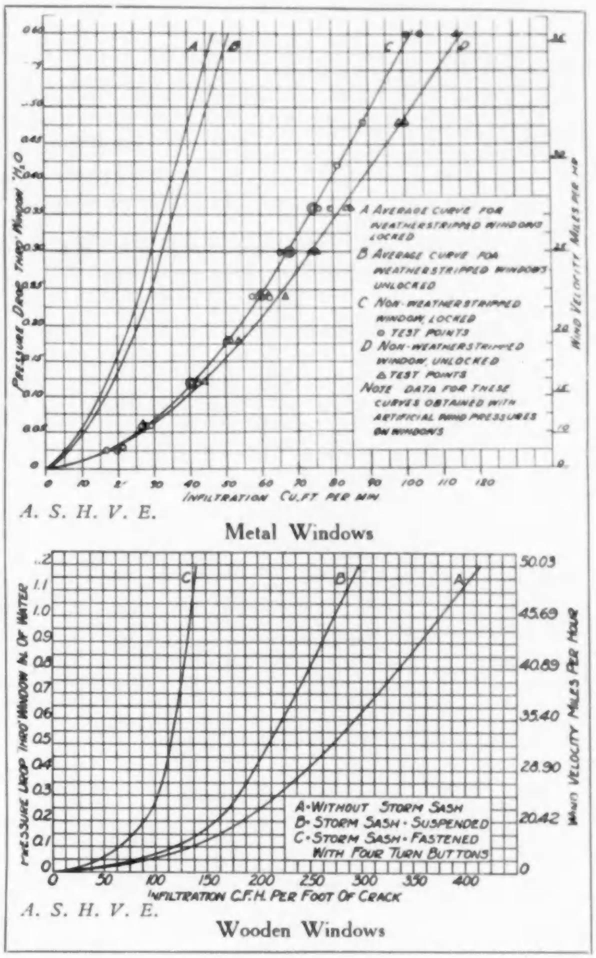


Fig. 3.
Infiltration Through Double Hung Window Types

physical nature and construction of each one. Percentages vary also with changes in temperature and wind velocity. A pitched roof, for example, with a high wind velocity might show a greater loss than a flat roof under the same conditions; and a low temperature combined with the exterior convection might show a greater loss for a flat roof than a pitched one. Under different conditions of exposure a similar variance in loss through walls, doors and windows might be noted. In general, due to radiation and convection, more heat is lost through roofs and glass areas and by filtration than by direct transmission through other parts of the building.

B. *Loss by filtration through materials and through cracks* constitutes in most cases a large part of the total heat loss of a building. Filtration through materials is usually unimportant, except for high wind velocities. The amount of leakage varies within wide limits and is a function of the number and size of window and door openings, their type and the manner of their installation. Percentages of heat loss are as generally inaccurate here as in the case of direct transmission.

TABLE I.
THERMAL CONDUCTIVITIES OF VARIOUS INSULATING MATERIALS

D = Weight in pounds per cu. ft.
T = Mean temperature in degrees Fahr.
K = Amount of heat in B. t. u.'s flowing through 1 sq. ft. of material, per inch thickness, per hour, per temperature difference between faces of 1° Fahr.

NOTE. The values of D, T, and K are those determined by the U. S. Bureau of Standards, with the exception of those marked with an asterisk (*), which are by Professor J. C. Peebles of Armour Institute, Chicago.

Material	Description	D	T	K
	LOOSE MATERIALS			
Rock wool	Fibrous material made from rock. Also made in sheet form, felted and confined with wire netting	6.0	90	.26
		10.0	90	.27
		14.0	90	.28
Sprayo-Flake	Shredded paper with silica binder	4.2	94	.28
Glass wool	Pyrex glass curled	4.0	90	.29
		10.0	90	.29
Sil-O-Cel	Powdered diatomaceous earth	10.6	90	.31
Regranulated Cork	Fine particles, about 3-16 in.	9.4	90	.30
		8.1	90	.31
Thermofill	Gypsum in powdered form	26.	90	.52
		34.	90	.60
Sawdust	Ordinary	......	86	1.04
Insulex or Pyrocell	Cellular gypsum, dry	18.	90	.59
	FLEXIBLE MATERIALS QUILTED			
Dry Zero (n)	Kapok (ceiba fibers) between burlap or paper	* 1.9	75	.23
		1.0	90	.24
Cabot's Quilt	Eel grass between Kraft paper	3.4	90	.25
		4.6	90	.26
Balsam Wool (n)	Chemically treated wood fiber between paper	2.2	90	.27
Linofelt (n)	Flax fibers between paper	4.9	90	.28
	FELTED			
Hairinsul (n)	50% hair, 50% jute	6.1	90	.26
	75% hair, 25% jute	6.3	90	.27
Hair felt (n)	Felted cattle hair	11.0	90	.26
Thermofelt (n)	Hair and asbestos fiber, felted	7.8	90	.28
	Jute and asbestos fiber, felted	10.0	90	.37
Fibrofelt	Flax and rye fiber	13.6	90	.32

Material	Description	D	T	K
	COMPACT MATERIALS SEMI-RIGID			
Torfoleum	Peat moss compressed in sheets	*11.0	70	.26
Cork Board	No added binder, very low density	5.4	90	.25
	No added binder, low density	7.0	90	.27
	No added binder, medium density	10.6	90	.30
	No added binder, high density	14.0	90	.34
Flaxlinum	Flax fiber	13.0	90	.31
Rock Cork	Rock wool block with binder	16.7	90	.37
Lith	Rock wool, flax and straw pulp with binder	14.3	90	.40
	RIGID BOARDS			
Masonite	Wood fiber exploded and compressed	*19.8	75	.33
Insulite	Wood pulp compressed	16.9	90	.34
Celotex	Sugar cane fiber, compressed	13.2	90	.34
Maftex	Licorice root fiber, compressed	*16.1	81	.34
Thermasote "A"	Chemically treated wood fibers	*18.6	75	.34
Magnesia	85% magnesia, 15% asbestos	19.3	86	.51
Gyplap	Gypsum, between layers of heavy paper ½ in. thick	53.5	90	2.60b
Asbestos Mill Board	Pressed asbestos	60.5	86	.84
Sheetrock	Gypsum, mixed with sawdust, between heavy paper (0.39 in. thick)	60.7	90	3.60b

(b) For thickness stated or used in construction; not per 1 inch thickness.

(n) = not compressed.

VI. METHODS OF INSTALLATION

These are governed by the type of insulation employed. Efficiency depends largely upon the completeness of application and excellence of workmanship in accordance with manufacturers' instructions.

1. *Walls and partitions* may be insulated by the use of any type of material. *Loose* materials are sifted or packed into the wall after the sheathing is in place and as the lathing progresses. Installation by blowing or pouring is usually done after the wall is nearly enclosed. *Flexible* blankets or felts should create an additional air space within the wall, as separation of surfaces raises the insulating efficiency of the construction. *Compact* materials are placed like the loose type in the case of a semi-rigid selection. When boards are used, speed of construction may be increased with a consequent saving in cost.

2. *Floors.* Materials and methods for walls are applicable for this part of construction.

3. *Roofs.* Due to convection, heat losses are usually higher than for other structural components, especially in high buildings where a stack

action is developed. Insulation methods should provide for the worst conditions. In extremes or quick changes of temperature, expansion or contraction may cause serious damage to either the roof structure or supporting members if no insulation is used. Pitched roofs may be insulated by methods indicated for walls. Flat roofs should be insulated on top for minimizing effects of temperature changes. For prevention of condensation, additional insulation should be employed on the underside of roof constructions, the type of material varying with the type of roof construction.

4. *Openings.* Reduction of heat loss through glass areas may be accomplished by the use of unusually thick or laminated glass or by the use of double windows, the latter being the most efficient due to the insulating value of increased surface resistance and air space. It is not desirable to seal a building hermetically, even when ventilating or air conditioning systems are used. Weather stripping is valuable in lessening filtration, depending on type.

VII. VALUE OF BUILDING INSULATION

No numerical data can be given to indicate the value of thermal insulation. As has been noted, it is a relative consideration necessitating a thorough analysis of governing factors for its statement. Such an analysis usually establishes a need for some methods of thermal insulation, and where materials utilized in this category are efficient as structural members or applicable in methods of sound control, their value increases as a function of their usefulness. Many of them may be efficiently employed in unusual constructions with a possible increase in floor area and a decrease in weight of constructions. The theory of insulating materials, relating to their specific heat and combination with structural factors for the realization of greater speed, economy and efficiency in heating than now exists, is incomplete. Toward the end of a lighter, more adaptable building construction, the development of this theory may be an aid in designing future constructions, possible of shop fabrication.

REFERENCES

Fansler, P. E. *Minimizing Heat Losses in Residences.* The Architectural Forum, Vol. LI, No. 1, July, 1929.

Fansler, P. E. *Infiltration and the Heating Problem.* The Architectural Forum, Vol. LI, No. 4, October, 1929.

American Society of Heating and Ventilating Engineers, *Guide,* Vol. VIII. New York, 1930.

Brabbee, C. W. *Heating and Ventilating.* McGraw-Hill, New York, 1927.

Bureau of Standards. *Thermal Insulation,* Circular Letter No. 227, April 19, 1927.

Griffiths, Ezer. *Heat Insulators,* Special Report No. 35, Department of Scientific and Industrial Research. H. M. Stationery Office, London, 1929.

Griffiths, Ezer, and A. H. Davis. *Transmission of Heat by Radiation and Convection.* H. M. Stationery Office, London, 1929.

Heilman, R. H. *Transmission of Heat Through Insulation. Mechanical Engineering,* Vol. 52, July, 1930.

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J

THE ARBITRATION OF DISPUTES BETWEEN ARCHITECTS AND THEIR CLIENTS

BY

ARTHUR T. NORTH

EVERY exchange of services, merchandise or commodities for money or any other thing should be controlled by a contract. Architectural services are especially amenable to contractual control. Unlike other professionals, such as lawyers and physicians, the competent architect can predetermine the successful conclusion of his professional undertakings. Notwithstanding the architect's good intent, ability and the effectiveness of his organization, there are conditions pertaining to every professional service which make a controversy, claim or breach of contract possible, caused by one or both of the parties thereto. It is but reasonable to take every possible precaution to forestall untoward eventualities.

Controversies, claims or breaches of contract are settled by argument and possible compromise, or, in the event of inability so to do, they are settled by litigation or by arbitration. Before engaging in a relationship that may result in either litigation or arbitration, the advantages and disadvantages of both methods should be investigated with particular reference to the nature of the service or exchange, and the local customs and conditions that may affect the possible litigation or arbitration. Aside from the immediate results arising from the successful or unsuccessful conclusion of these undertakings, the future effect on the reputation, practice or production of the participants should be given due consideration.

LITIGATION

The *only* advantage resulting from litigation is an eventual settlement of the controversy. On every hand we read of the deplorable state of practically every phase of American jurisprudence, resulting apparently from the interminable delays in court procedure. It is claimed in some localities that there exists a breakdown in our legal and judicial machinery. This is not an inviting prospect for the litigant who must have, for any of numerous valid reasons, a prompt adjudication of the dispute. These delays entail a loss of valuable time and some of the several advantages of a successful action and, also, a great expense that is often disproportionate to the values involved. Litigation often compels the disclosure of methods and practices that are valuable to competitors, and this exhibition in open court to inevitable publicity may result in losses that are unexpected in addition to losses that ensue from an adverse decision. There also attaches to litigation a certain degree of disesteem to a professional practitioner which involves his reputation for business acumen or his inability to maintain satisfactory business relations with his clients.

ARBITRATION

A proper arbitration clause, hereinafter given, incorporated in the contract between the architect and the client, insures many advantages to both parties with no disadvantages. The advantages are all demonstrated by experience.

(1) *Time.* Arbitration saves valuable time by securing speedy settlements of disputes; permits the early enjoyment of the results of the judgment; and makes unnecessary the impounding of funds to satisfy a possible judgment during a long period of time. Under the arbitration clause suggested, neither party can delay proceedings by his own action more than twenty-one days unless by mutual consent. Arbitrations are usually concluded by the arbitrators in one hearing, and the award made immediately thereafter. Protracted delays are impossible. Under ordinary circumstances, awards are made within a week or ten days after the arbitration proceeding is instituted.

(2) *Cost.* The cost of an arbitration is nominal, depending upon the amount involved. Arbitrators furnished by the American Arbitration Association serve without compensation, except reimbursement for actual expenses incurred, unless the parties enter into a special agreement to the contrary. Either party, on agreement, can engage and be represented by counsel.

(3) *Competency of Arbitrators.* The arbitrators are selected for their particular knowledge of the customs and practices of the profession or business involved. The competency of the arbitrators makes possible more intelligent and just awards than can be secured by court juries.

(4) *Hearings.* Arbitration hearings are held in the place most convenient to the parties except the premises of either, unless mutually agreed.

(5) *Privacy.* Arbitration hearings are held behind closed doors, unless mutually agreed other-

wise. This privacy prevents the disclosure of private data and information which might be of value to competitors, trade secrets are not divulged, and unpleasant notoriety is avoided. The advantage of privacy is not possible in court proceedings.

It is found by experience that when arbitration clauses are incorporated in contracts, each party recognizes a protection to his contract, and the knowledge that he will be compelled to abide by a just settlement of any dispute prompts a proper performance and a desire to settle the dispute amicably. The enmities that are engendered by litigation are avoided, and by arbitration good will is maintained.

ARBITRATION LAWS

The spread of the arbitration movement has been rapid, aided materially by the Federal Arbitration Law. Arbitration procedure varies somewhat according to the state laws wherein the contract is operative.

Properly prepared arbitration clauses are now valid, irrevocable and enforceable under the arbitration laws of the states of Arizona, California, Connecticut, Louisiana, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania and Rhode Island and under the Federal Arbitration Law.

Properly prepared submissions are generally valid, irrevocable and enforceable under the arbitration laws of Colorado, Illinois, Iowa, Kentucky, Michigan, Minnesota, Nebraska, Nevada, North Carolina, Oregon, Utah, Washington, Wyoming, and in Georgia after the *delivery* of the Submission, and also under the Federal Arbitration Law.

In certain other states, as Arkansas, Florida, Idaho, Indiana, Kansas, Montana, Ohio, Tennessee, Texas, Vermont, Virginia and West Virginia, the Submission is enforceable only when it is made a rule of court.

In some states, as Indiana, Kansas, Ohio, South Carolina and Washington, the filing of a bond may be necessary to insure performance of the award.

If it is desirable to make the judgment of the arbitrators a matter of record, the arbitrators certify the judgment to any court of record, and it is properly recorded.

The facilities of the American Arbitration Association* are now available, upon request of a party to a controversy, in 1,700 cities located in all of the states and the District of Columbia, in which 7,000 arbitrators are located. The parties to a contract can secure the services of these arbitrators if it is desired, or they can select others.

*The American Arbitration Association, 521 Fifth Avenue, New York.

ACTUAL RESULTS

Admitting all of the advantages claimed by the proponents of any proposal, it is reasonable to consider its actual working. Through the courtesy of the American Arbitration Association, brief abstracts of a few awards are presented. Architects will recognize the cases as common to the practice of architecture.

The owner of a building withheld payment of the architect's fee because the actual cost of the house was greater than the estimated cost. The matter was referred to arbitration, and from the evidence submitted a jury might have agreed that the owner was justified, but, as the increase of the actual cost over the estimated cost did not exceed what is usual in building operations, and any person familiar with such operations would realize that the owner had received full value for the money expended, the architect was awarded the amount of fee claimed. The case was submitted to one arbitrator, a well known New York architect.

An owner refused to pay the balance due the architect, claiming that because of the architect's lack of supervision, acceptance of work that was improperly done, and lack of judgment generally in carrying out the provisions of the contract, the owner had been damaged to an extent far exceeding the balance due the architect. To a jury not familiar with the term "supervision," the owner's claim may have been justified. The architect proved, however, that he had visited the job every day and had performed every service that is customary under the term "supervision," which in the owner's mind was confused with the term "clerk of the works," which requires constant supervision. The contract included an arbitration clause, and it was agreed to submit the case to the American Arbitration Association. One arbitrator, an architect, was agreed upon who decided that the architect had not been negligent in his supervision, that the owner had not been damaged by his failure to perform his work properly, and awarded the architect the amount of his fee.

Another interesting case concerned the services of an architect in designing a church group or unit. The minister of the church and his board of trustees were rather ambitious and idealistic and wished to have a church designed to conform to early architecture, which would be a model for other churches of that denomination in this country. The architect was engaged and prepared designs for the entire scheme, the understanding being that, while money was not immediately available for all of the proposed buildings, part of it would be constructed. One unit was completed, and the work stopped. Meanwhile the minister who had authorized the work, with the authority

of his board of trustees, had left the church for another charge, and the fee of the architect remained unpaid. The new minister and some of the new members of the board of trustees felt that the scheme was too ambitious and that they never would be able to raise the money required to carry it out, and were critical of the work already done. Therefore they refused to pay the remaining unpaid amount of the architect's fee, and after considerable negotiation the matter was referred to arbitration. The board of arbitrators, consisting of two business men and an architect, awarded the architect the major part of the fee claimed.

An architect was engaged to design buildings upon a country estate for a wealthy New York banker. A fine piece of property on Long Island was purchased and preliminary work started. It was decided that they would first build the service buildings on the estate, and they were designed and erected. There were a number of discussions between owner and architect concerning the main house, after which the owner went abroad. On his return, the owner was very much surprised by the architect's very lavish plans for the house and the enormous estimated cost, which far exceeded his expectations. They disagreed, and the owner engaged another firm of architects who submitted plans which were approved. The original architect claimed compensation, under the Architect's Standard Compensation Rules, for the time and work expended on the preliminary studies for the main house. The owner declined to pay the architect's fee, claiming that he had received no benefits from the architect's work. The case was submitted to three arbitrators—a lawyer, an architect and a business man. The original architect contended that the reason the new architects could so readily submit a plan approved by the owner was because the owner's ideas had been definitely formed by the claimant's own preliminary studies. The arbitrators awarded him a considerable part of the fee claimed.

STANDARD CLAUSE

While the New York Building Congress and other organizations have adopted and used successfully arbitration clauses in all kinds of contracts, for general use throughout the United States, the American Arbitration Association has prepared the following standard clause which contains the essential legal requirements for domestic contracts between architect and client:

Any controversy or claim arising out of or relating to this contract or the breach thereof, shall be settled by arbitration, in accordance with the Rules, then obtaining, of the American Arbitration Association, and judgment upon the award rendered may be entered in the highest court of the forum, state or federal, having jurisdiction.

The arbitration clause in the American Institute of Architects Standard Agreement between Owner and Architect (1917-1926) reads as follows: "12. Arbitration.—All questions in dispute under this agreement shall be submitted to arbitration at the choice of either party." The weakness of this clause lies in the fact that no rules of procedure are defined; and for that reason one of the parties could, if so disposed, require that a court define the rules of procedure for the arbitration. An arbitration clause is not complete, therefore, unless it specifically defines the rules of procedure that shall apply.

The arbitration of disputes and the inclusion of an arbitration clause in every contract between the architect and the client is but an intelligent and businesslike procedure. Many architects are careless in this respect and suffer loss of prestige thereby. Either party who would object to such a clause might well be subjected to extraordinary precautions.

Concerning the subject of arbitration, Robert D. Kohn, President of the American Institute of Architects, is quoted: "I am surprised to find how few architects include an arbitration clause in their contracts or agreements for their own professional services. The general adoption of our American Institute of Architects General Conditions of the Contract for the Construction of Buildings has made arbitration between owner and contractor common enough. But I find that architects rarely include an arbitration clause in the contracts between the owner and themselves. In our own office, we use the New York Building Congress form. But whatever may be the form, I do urge all architects to see that arbitration is provided for in case of any dispute over their pay for services. I have had to testify in court a number of times recently in cases involving other architects. As a result, I have an unholy horror of the time-wasting, nerve-racking procedure of the law in attempts to settle such matters." Mr. Kohn does not oversate the case.

THE EMPIRE STATE BUILDING

IV. HEATING AND VENTILATING

BY

HENRY C. MEYER, JR.*

IT is perhaps to be expected that the heating and ventilation of a structure as large as the Empire State Building would introduce new problems that require some thought and ingenuity to solve, especially in the matter of ventilation of the lower stories which cover an area of something like 425 by 200 feet, embodying large spaces that are sufficiently remote from windows to require artificial ventilation for their successful occupancy. The running of steam piping for a building 86 stories in height also presented a problem. In addition to the 86 stories there will be the observation tower rising 200 feet higher than the main structure. Two observation galleries at the base of the tower and one at the top are to be heated.

It has been the experience of the writer that it is practically impossible, especially in the hot, sticky days of summer and the severe days in winter when the windows have to be closed, for office workers to work efficiently in unventilated interior spaces remote from windows. Artificial ventilation is not perhaps necessary in large loft spaces, even if a good deal of it is remote from windows, if the space is to be used as a sales room for the display of merchandise and the number of people there is small. But where these spaces are used for office purposes, fairly densely occupied, and where the occupants are under a mental strain, the writer is convinced that artificial ventilation is of great importance.

COSTS OF MECHANICAL VENTILATION

The financial side of ventilating spaces in office buildings used for commercial purposes should be a matter of some interest. It was found in the case of a prominent bank building located in the financial district in New York that the cost of artificially ventilating 75 square feet of space, which was the amount of space allotted to each occupant, amounted to about $20 per year. This charge covered the cost of current to drive the fans, the cost of steam required to warm the air for ventilation, the fixed charges on the ventilating plant, the fixed charges on the cost of the increased story height required by the horizontal ventilating ducts, and the value of the space occupied by the fan room, all being prorated to the 75 square feet of rentable area. If the average compensation to the worker was $1,000 a year in salary, it meant an increased cost of 2 per cent to maintain proper working conditions. It is believed that a good deal more than 2 per cent more work could be accomplished by the occupant if surrounded by good air conditions than would be possible with conditions that would exist in such a space without ventilation.

Expressed in another way, if the 75 square feet of the space is rented for $2.50 per foot or a total of $187.50 per year, the cost of ventilating at $20 would be about 11 per cent of the rental. While this may seem quite a burden, it is not very much if artificial ventilation converts undesirable area into space that can be used with comfort and satisfaction on the part of the occupants. For these reasons one should feel gratified that the owners of the Empire State Building were far-sighted enough to be willing to go to the expense of ventilating the lower stories of the building, where the areas are large.

BASEMENT VENTILATION

Reference has been made to the necessity of ventilating the two basements and the five lower stories of the building. A study of this problem was made with the idea always in mind that there was no telling to what use these spaces might be devoted during the life of the building, and it was felt that unless a flexible system of ventilating could be designed to meet any reasonable situation that might arise, the system would be a failure at the start.

Arrangements were made to take what was believed to be a sufficient volume of air into the building at the southwest corner on the second floor. A vertical shaft connecting with the air intake extends to the floor of the lower basement and there connects with a large underground supply duct which extends entirely around the space devoted to elevators, stair wells, etc. With such an arrangement, it is possible to locate supply fans at many points in the basement so as to meet the needs of the situations that might from time to time arise. The scheme for the use of an underground supply duct was selected for the reason that it required excavation for the dimensions of the duct only, rather than throughout the whole sub-basement, which would be necessary if the duct were placed at the ceiling

*Of Meyer, Strong & Jones, Inc., Consulting Engineers for mechanical and electrical equipment of the Empire State Building.

with normal floor clearance below, as is often done. Inasmuch as all sub-basement excavation had to be made through rock, this scheme of the underground duct made possible a tremendous saving in time and expenditure in excavation.

Large exhaust shafts of ample size to take care of kitchens extend from the basement to the top of the building, with space for fan rooms at the top for such exhaust fans as may be required. The exhaust from other sections of the basement is taken care of by exhaust shafts extending to the fifth floor, where the discharge is arranged for through the roof over the first setback.

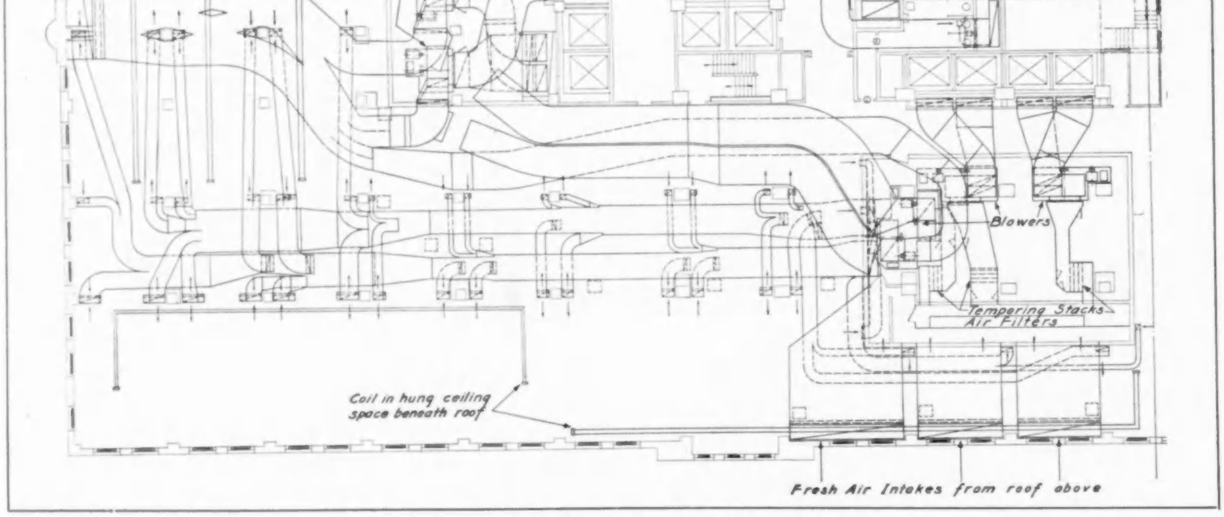
FIRST TO FIFTH FLOORS

For the ventilation of the first to the fifth floors, inclusive, there are four large supply fan rooms on the fifth floor, each taking care of a quarter of the building. A drawing of the northeast corner of the fifth floor is given. Air for this part of the building, and in fact for all quarters, is taken in through an intake on the roof over the fifth floor, where a setback occurs. It extends downward through the roof to large, flat horizontal ducts extending horizontally to the filter chambers. The horizontal ducts are of copper, properly drained and covered with non-conducting material. In each of the fan rooms there are three blowers, one supplying air to the first and second floors, another to the third and fourth floors, and the third to the fifth floor. They supply air downward through vertical shafts connecting with horizontal trunk ducts on each floor which are located over the corridors and extend around the utility space. Similar trunk exhaust ducts extending around each floor in similar manner connect with vertical shafts at the end of the utility spaces, and, on the ceiling of the fifth floor, transfer horizontally to exhaust fan rooms, the exhausters discharging out through the roof over the fifth floor and as close to the extreme east and west ends of the building as possible. The extensive setback which occurs at the sixth floor level seemed to make it possible to discharge fans in this manner without objection by the tenants on the floors above and obviated the necessity of providing shafts to the roof for the discharge of this air.

It is intended to extend branch ducts from the supply and exhaust trunks in such a manner that each separate bay of the building, except those along the outer walls, will be provided with supply and exhaust registers. These are located at the columns in such a manner that if partitions are confined to column center lines, each interior bay will have its independent supply and exhaust.

VENTILATION ABOVE FIFTH FLOOR

Provision has been made in the vertical shafts for the installation of clubs, with their necessary kitchens and dining rooms, on the sixth and 21st floors; it is intended to locate a supply fan on each of the club floors with the necessary horizontal distributing ducts. The main shaft extending to the roof and intended to ventilate kitchens is believed to be of ample size to take care of the needs of any kitchen required by the club. As all toilets are interior rooms, there are four toilet exhausters located on the 85th floor, each fan having a capacity of 40,000 c.f.m. There are seven blowers and seven exhausters located in various parts of the building for ventilating



Ventilating System, Northeast Quarter of the Fifth Floor

the elevator machinery rooms, with a total capacity of about 75,000 c.f.m. supply and exhaust. It may be of interest to note that approximately 400 square feet had to be allowed for in the utility space of the upper floors for vent shafts to accommodate the toilet exhaust flues, the basement kitchen exhaust flue, and the several other exhaust flues from kitchens and restaurants in the upper stories of the building.

AIR FILTERS

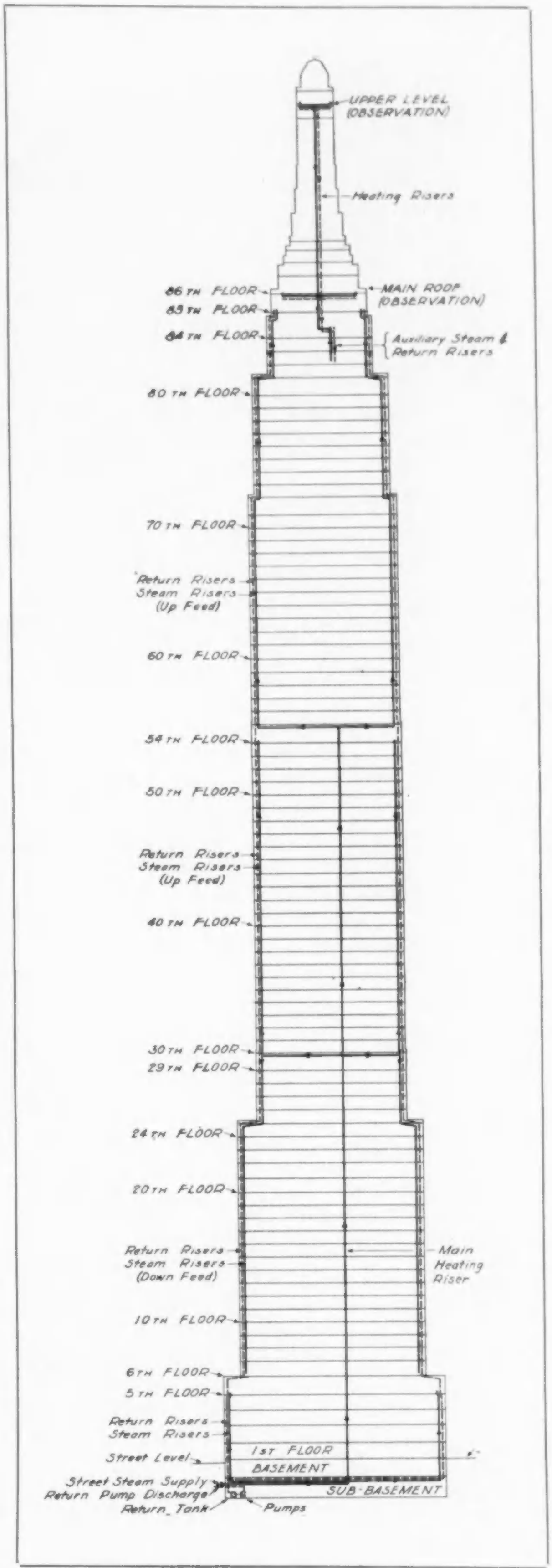
All the air supplied to the building is filtered through dry air-mat type filters consisting of sheets of porous paper, which provide a filtering medium of high efficiency, at the same time offering only a surprisingly slight resistance to the air flow. All fan motors are of the variable speed type, so that the volume of the air supplied and exhausted on the various systems can be regulated to suit conditions.

HEATING

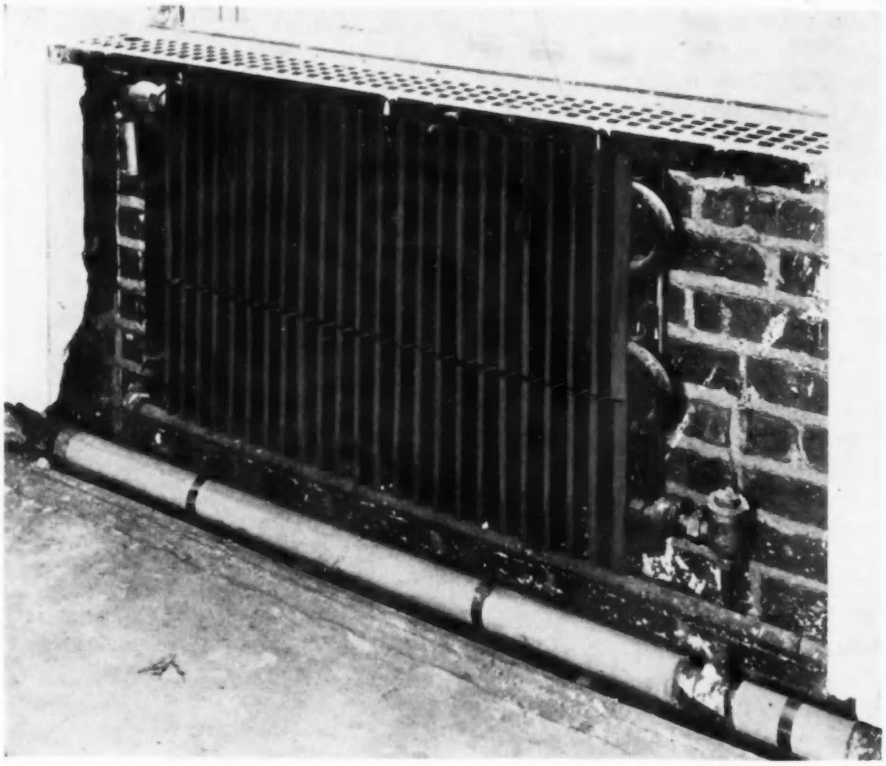
Some idea of the magnitude of the equipment can be had when it is said that the building will contain about 7,000 radiators with a total of 227,000 square feet of heating surface. It is not known at this time how much air will be required for the basements, but the total supply for the first to the fifth floors, inclusive, would be about 292,000 cubic feet per minute with an exhaust of the same amount. The study made during the early stages of the preparation of plans led the owners to contract for an outside supply of steam. When it was found that a chimney of proper size for the building, with its surrounding ventilating space for the boiler room and enclosing masonry, occupied an area of about 350 square feet on all floors of the building, and a proper charge was made for the value of the space so used, a boiler plant within the building did not seem to be justifiable. It was possible to supply the building through two entirely independent steam mains, entering on 33rd Street, both connected with the distributing mains of the local steam company. This seemed to afford ample protection against serious breakdown.

THE SYSTEM

The heating of the building will be accomplished by a two-pipe vacuum system with steam turbine-driven vacuum pumps discharging through suitable heat exchangers into the sewer. On account of the very great height of the building, some 86 stories, with the observation tower 200 feet high in addition, it was manifestly impossible to employ one set of risers supplying radiators on all floors on account of the size of pipes that would be required. The heating equipment was therefore divided into four separate zones, the lower zone up to and including the fifth floor being supplied from mains in the subbasement; the section from the sixth to the 29th



Steam Distribution Zones



Radiator Installed in Wall Recess under Window Ready for the Placing of the Metal Enclosure

floor, inclusive, being supplied downward from a set of mains on the 29th floor ceiling; the section from the 30th to the 54th floor being supplied upward from mains on the ceiling of the 29th floor; and the top of the building, including the observation tower, from a set of mains on the 54th floor ceiling. Additional floor heights were provided on the 29th and 54th floors so that the mains could be run without interfering with proper ceiling heights. Considerable setbacks of the building occur at the sixth and 30th stories.

Some idea of the extent of the equipment required for the heating may be had from the size of the low-pressure steam supply riser, which is 24 inches in diameter up to the 29th floor; from that level up it decreases in size proportionately. This riser by itself weighs well over 100 pounds for each foot of its height, and its expansion joints weigh two tons each.

CONCEALED RADIATION

An interesting feature of the heating of the structure is the fact that practically every radiator in the building is concealed by a removable enclosure of sheet metal with the bottom grille at the floor and a top grille at the sill level. The use of radiator enclosures with a minimum of encroachment on the rentable space was made possible by the remarkably clever design of the exterior walls by the architects, Shreve, Lamb & Harmon. The windows are practically flush with the outer face of the building walls, thus giving space beneath the windows for the radiators and enclosures without the need of their projecting out into the rooms beyond the wall line. Detailed drawings of the radiator enclosures are shown. Radiators will be of the copper tube type, bracketed to the walls. Practically all radiators are under automatic control, this not only tending to reduce the cost of steam required but to maintain proper and constant temperatures for the benefit of the tenants of the building.

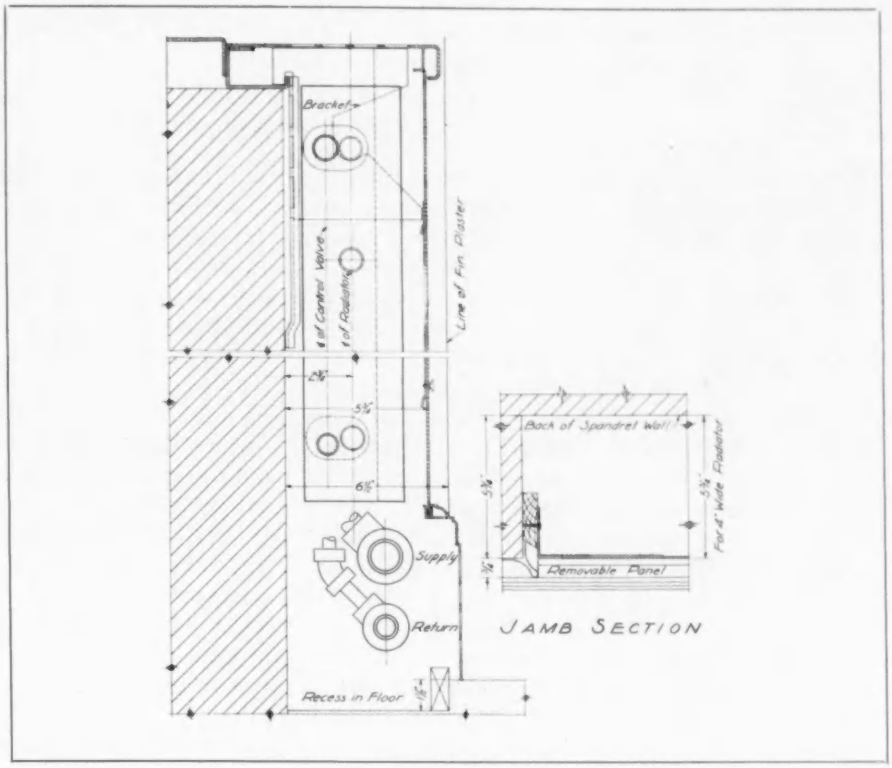
All risers and radiator runouts will be concealed. There will be a pair of risers for each bay, with the runouts installed above the floors within the radiator enclosure. The return runouts to radiators, as well as all medium-pressure system return piping except risers, will be of brass. Expansion in risers is to be allowed for by the use of expansion joints, loops and riser offsets.

ACCESSORY SYSTEMS

A separate system of steam mains is provided for medium-pressure steam required by such kitchens as may be located within the building and for heating hot water. A separate main is also provided for the steam required to warm the air for ventilating purposes. These two systems and that supplying the steam for direct radiators are separately metered, so that information as to the amount of steam required for the various services can be obtained.

THE EQUIPMENT

There will be four turbine-driven vacuum pumps which will receive the condensate from both the low- and medium-pressure system returns and drips during the winter season. The pumps



Section Through Enclosure for 4-inch Radiators

will be so connected that any one or more pumps can handle the entire load, the number of pumps operating being governed by the load. For summer service there will be a single electrically-driven unit to handle the condensate from the medium-pressure kitchen and hot water generator system. The returns and drips on the kitchen apparatus and hot water generators will be controlled by thermostatic type valves and traps discharging into a vented trap, which in turn will discharge into the receiving tanks at the vacuum pumps. The hot condensate from the vacuum pumps will discharge through two heat exchangers, through which the service water for hot water for the building is run ahead of and in series with two of the hot water generators. In this condensate line beyond the heat exchangers there will be an automatic mixing valve for further cooling the condensate before it enters the sewer.

There will be a control panel in the sub-basement, from which, by means of pneumatically-operated switches, valves on the steam mains on the sub-basement, 29th and 54th floors can be opened or closed. The mains and valves on each of these floors are so arranged that there will be one pneumatically-operated valve controlling the radiation on the east and south walls of a vertical zone and another controlling the radiation on the west and north walls of each zone.

VESTIBULE HEATING

The five entrances on the first floor will be heated by means of a recirculating hot blast system. There will be a separate fan for each entrance that will draw the air from the ceiling of the entrance corridor and, after passing it over tempering stacks, discharge it into the entrance vestibules and corridors through registers near the floor. Three rows of these stacks are under remote manually-operated control, and two rows under thermostatic control with the thermostat located at the fan intake. Provision has been made to take the air from outdoors instead of from the corridors in case it is found desirable to create a pressure in the entrances to counteract the natural indraft.

The hung ceiling space under the sixth floor setback is provided with pipe coils, controlled from an accessible position, to counteract the cooling effect of the roof above. Some of these coils under that setback are shown on the quarter plan of this floor.

This is the fourth of a series of articles on the Empire State Building. The first article, in the June issue, was devoted to a discussion of its organization; the second article, which took up the "Window-Spandrel-Wall Detail and Its Relation to Building Progress," was published in the July issue; and the third article, which appeared in August, was given to the consideration of "The Structural Frame" of this exceptional building.

THE SELECTION OF THE BUILDER

BY

H. C. TURNER

PRESIDENT, TURNER CONSTRUCTION COMPANY

TO set up properly an income-producing building, the designer, the owner, the builder, the real estate agents and the manager should compose the creative group to devise, build and equip the structure. This group should sit as a building committee, directing decisions which the architect, as secretary of the committee, incorporates in the minutes, that is, in the plans and specifications. We do not see the architect as in any sense an overlord or independent deity who can do no wrong. He has a better chance of keeping out of trouble if he works with these other directors in his task, taking into account the elements of cost . . . . etc," said R. H. Shreve of the firm of Shreve, Lamb & Harmon.

COST AND PLANNING. The ultimate cost of the building becomes of great importance. Can the experienced builder render a valuable service to the architect and his client at this early stage of the work? Many architects, out of a wide experience, possess a large volume of cost information, but their major thought and work are concerned with the conception of the plan and its development and not with the recording and analysis of a vast amount of cost data for application to the detailed estimates of the cost of the prospective building. The builder keeps an itemized record of the cost of every operation he performs and maintains a staff of cost experts whose sole function is to study the actual cost of the buildings completed and to apply this exact knowledge and experience to estimating.

The builder should be admitted to the early conferences of the architect and his client. There will be found to be several ways of building the structure and also a choice of building materials. Estimates of relative costs of these methods and of the available materials will open a discussion which may well fix a procedure which will have a determining effect upon the ultimate cost and financial success of the operation.

THE TIME ELEMENT. Can the work be done in eight months, ten months, or twelve months?—really an important question, with interest and taxes accumulating during construction to a considerable sum of money. The builder prepares a time study covering every subdivision of the building. This study aids the architect and his client in making fundamental decisions, and it can be made by a capable builder from the preliminary plans.

I have mentioned valuable services which a capable and experienced builder can and should render, and render at the time when the advice is usable,—that is, during the development of the plans. These services may be quite as valuable to the architect and his client in securing a financially successful building as the contracting for materials and sub-contracts and the supervision of the actual work of the installation at the site. The finest and largest buildings have been built by builders who were selected because of their integrity, experience and organization. Buying on a price basis tends to destroy morale and leads to cheapness.

WHICH CONTRACTOR? Contractors possess different backgrounds of experience, different conceptions of good workmanship, and different types of organization. The proposals received from them are not exactly comparable, sometimes far from it, and yet in a price competition on a given set of plans and specifications, the architect and his client are inclined to rate the builders as equals and to select on price. No really intelligent person would say that if every one of the builders could have the opportunity to perform the work, that the results would be equal in value. Some builders discount the probability of there being extras, discount the cost of materials and sub-contracts, and otherwise start out to build a building for the architect and the client on a relationship which is not likely to produce the singleness of purpose which should control every operation,—namely the production of a building of sound materials, sound workmanship, in the least time without the waste of a dollar, and one that will not require high maintenance charges.

PRICE—OR PURPOSE AND PERFORMANCE? The selection of a builder on price alone is not followed for the finest work. The reason is obvious and might with profit be more generally applied. Every building should be built by men whose purpose is fine craftsmanship combined with sound business methods. I have been on the other side of the fence and have acted as chairman of the building committees for several large operations, and as such have advocated the selection of the builder on merit,—that is, on his known qualifications to perform successfully the work to be done. Such a plan establishes a community of interest on the part of the client, the architect and the builder that permits free and full discussion of the plans and specifications, the costs and the progress of the work in the field. The utmost of building is secured for the money expended.

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 19. STRUCTURAL CARPENTRY

UNDER the heading of "Structural Carpentry" is generally included all the work of carpenters in materials that are not intended to be left exposed and "finished," that is, hand-smoothed, and oiled, varnished or painted. Exceptions to this are the forms for concreting, which, for convenience, are usually included with other concrete work. Another exception is that of open-timbered work of any description. If such members are true parts of structural framing, they are included in the structural specification, as is mill construction in general; but if such exposed members are built falsely for effect, they may be classed with "Finish Carpentry."

In the case of the school contract which we are considering, there was, aside from the roof sheathing and purlin nailers, but little structural carpentry, other than the concrete forms and general temporary construction, all of which latter has been discussed in preceding chapters. This condition prevails in the general run of fireproof work, and hence, for the purposes of this discussion, we will assume the inspection of operations on buildings of wood frame construction. Such structural members are termed "timbers" and "dimension lumber," and are, in the main, products of coniferous trees,—pine, spruce, fir, hemlock, etc. A working knowledge of lumber and its classifications* is most valuable to a building superintendent. Lumber is a comprehensive subject, and much time may profitably be given to its study. Unfortunately, grading rules are not absolutely dependable, because of local variations and market conditions, though it would appear that United States departmental rulings can always be invoked to govern.

The two grades of dimension lumber best known to architects are No. 1 and No. 2. The grades poorer than No. 2 are generally considered unfit for any but very inferior or temporary construction. Since all computations for strength of wood members are based upon the use of No. 1 (or better) stock, none poorer is admissible, except where economy is sought by a proviso that "No. 2 dimension lumber of the kinds specified (or of the local market equivalent) may be used for non-bearing partition studding and bridging, for sheathing of roofs and floors, and for similar unfinished members not subject to loading; but no dimension lumber may be of a poorer grade than No. 2. Serious defects in all such lumber and sheathing shall be cut out."

Lumber yard terminology classes as "timbers," all lumber 5 inches and larger in least size, and as "dimension" all that is 2 inches and over in thickness, and under 5 inches. Dimension lumber is divided into "planks," 2 to 3 inches thick and 8 inches wide and over; "scantlings," 2 to 4 inches thick and under 8 inches wide; and "heavy joists," 4 inches thick and 8 inches wide and over. All sizes are nominal, that is, they refer to the sizes the pieces were supposed to be when run through the mill. Cutting, surfacing and shrinkage may have reduced any size from ⅜ to ½ inch, or even ⅝ inch, yet it is still called by the name of the size originally applied to it.

Lumber is termed "rough" or "undressed" in the condition in which it leaves the saw. But very little rough lumber finds its way to yards or buildings. Nearly all dimension lumber is surfaced (planed) on one side and one edge (S1S1E), both because it is considered more workable in this condition, and on account of the saving in freight. Lumber is generally specified to be kiln-dried, though, for some purposes, yard or "air drying" is supposed to be better, as it leaves the wood less brittle. Kiln drying is a quicker and surer process, is attended to with better care, and results in less distortion of the pieces. This matter of distortion is one of the most disturbing factors in wood frame construction. Joists and studding must be straight and capable of good alignment or they cannot give perfect wall and floor planes. They must be closely inspected with this end in view.

In the inspection of all structural lumber, however, it must be borne in mind that we are dealing with materials far from perfect; also that each piece has presumably been passed upon by an expert and *should* be admissible for its intended purpose. Nevertheless, there are certain factors in this connection that make re-inspection imperative. The lumber may have been misused since previous inspection; may have been used for temporary work; may have been improperly stored and become warped or seriously checked; may have been poorly kiln-dried, and hence suffered undue shrinkage; may even be the product of a remote mill not subject to authoritative inspection service. Of course, one must be constantly on guard against dishonest practice in lumber deal-

*See Circular 64 of the United States Department of Agriculture for methods of grading lumber; also Art. 10 on "Timber" in "Building Construction" by Whitney C. Huntington, C. E. (John Wiley & Sons, 1929); likewise the various bulletins of the many lumber associations which give specifications for lumber grading.

ing, as well as in all other building material supply. Lumber may be deliberately regraded, or a few pieces of poorer grade may be mixed into an order to eke out the required quantity. Such cheating must be detected, and can be by a superintendent of experience. A lesser expert should report his suspicions to his home office before finding fault. Particularly must inspectors observe the sizes, location and relation of large or loose knots in joists, remembering that some tight knots may later become loose. None should be permitted at bearings nor along edges between bearings. Large knots must not be close together, nor near edges, checks or cracks. In heavy timber, one is most concerned about checks and cracks. If these only extend in a short distance and are not long enough to seem serious, and are not too prevalent in a single member, they are not considered due cause for rejection.

In all such inspection and consequent rejection, if any, the superintendent and his employer are greatly aided by a specification clause to the effect that the architect or engineer is the court of last resort on the subject. Neither the contractor nor the supply concern may like this, but it would appear that the purchaser, through his agent, has a perfect right to say what he does or does not desire to have in his building.

The heavier timbers used in mill construction are usually designed in yellow pine or in its equivalent in Douglas fir. The latest rules for grading yellow pine* describe the three better grades as "select structural," "dense heart" and "structural square edge and sound." Regarding these, we are advised that, "structural material is graded primarily on the basis of strength as a beam or post. Defects are limited as to location as well as size and number, so that definite stress values can be assigned to the various grades." Select structural "is an extremely high grade for exceptional uses, as in long spans in bridges where used untreated and where high strength and durability are important." Dense heart grade "is expected to furnish most of the timbers used in heavy construction where high breaking strength is required." Structural square edge and sound grade "is for general use in building construction and to a large extent in mill construction. It is especially adapted to treatment with chemical preservatives; requires all material to conform to density requirement. Unless otherwise specified this grade admits any amount of sapwood." As to workmanship, the timbers for mill construction are usually specified to be smoothed four sides (S4S) for appearance sake. Posts have chamfered corners (or metal corner guards) and should be 2 inches larger in each dimension than demanded by a strict factor of safety, to allow for some depth of charring before failure, in case of fire. In some work, all timbers are required to be impregnated with a fire-resisting liquid, sometimes with creosote or other preservative. Ends of timbers resting on masonry have provision for airing by means of wall-bearing hangers or boxes, or otherwise, to reduce liability to rot. See Fig. 14 (e) and (k).

Sometimes, posts have 1½- or 2-inch holes bored lengthwise through their centers for like reason. Wall ends of joists, beams and girders have their top corners beveled, so that members will drop out, in case of fire or other failure, without wrecking the walls. See Fig. 14 (k). Unless anchorage is provided by the box itself, as shown in the drawing, strap anchors are used and, for fire release, placed close to the bottom of the member. Attention must be given to the evenness of all bearings, but especially of posts. These are ordinarily provided with cast iron or steel plates, which should be so formed as to permit inspection of bearings, as shown in Fig. 14 (l), (m), (n) and (o). All bearings should be perfectly squared so as to set level and cause the members to stand plumb. In properly designed mill construction, the posts are not permitted to rest directly on other wood members, but are made to extend down between girder ends to the steel plates, thus avoiding the accumulation of shrinkage from story to story. End shrinkage, as in posts, is negligible, but the shrinkage in width or depth of wood joists and girders may amount to considerable. Nor are such timbers dense enough to withstand the compression of heavily loaded posts. In cheap factory and warehouse buildings, a story or two in height, hardwood bolsters are sometimes substituted for metal plates in lines of posts, as indicated in the roof construction shown in Fig. 14 (a) and (b).

The floor joists or beams in mill construction are spaced 3 feet or more apart, and hence demand subflooring 2 inches or more in thickness. This is ordinarily matched (tongued-and-grooved), if of 2- or 2½-inch stock, and grooved-and-splined, if thicker than 2½-inch. Such heavy subflooring is run at right angles to the joists and the latter are not bridged. Ordinary joists, spaced 24, 18 and 16 inches on centers and less, are bridged at intervals of 6 to 8 feet between bearings; generally with wood strips placed X-fashion between the joists and termed "double-cross-bridging." For this purpose, 1 x 3-, 1 x 4- and 2 x 3-inch stock are most commonly used, with ends beveled to fit snugly against the sides of the joists, two nails in each end of each piece, 8 ds for 1-inch stock and 10 ds for 2-inch. Bridging of metal strips is used in similar manner, but requires less nailing.

Joists of any nominal depth may actually vary ¼ inch or more in this dimension, and hence must

* "Architects' Specifications for Southern Pine Lumber." Southern Pine Association, New Orleans, 1929.

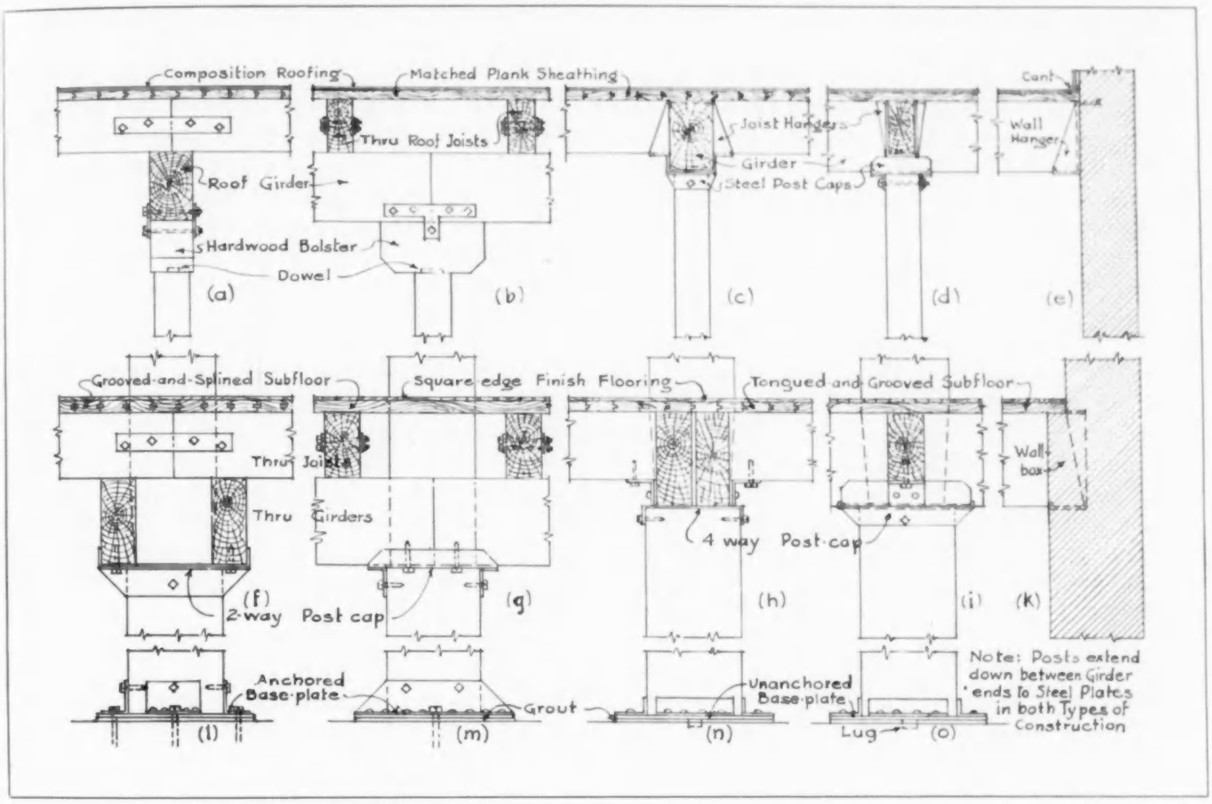


Fig. 14. Framing Details for Various Types of Mill Construction

be "sized" so as to be equal, since inequalities would be manifest in floors and ceilings. Few joists are perfectly straight, and therefore specifications call for them to be set with their "crown" or "camber" upward. After the joists are first set (to exact spacings marked on plates or walls), the end joist of a run is fixed in position and the others gauged by it and secured to it by "stay bracing" laid diagonally across the tops and temporarily nailed to each. Rafters are similarly stay braced ahead of sheathing. Joists that rest in masonry below the top plate should have no wood member under their ends (such as the old style bonding timber), as such members rot out faster than the joist ends. After joists are stay braced and before laying the subflooring, the bridging is set, using a chalk line as guide. For convenience, bridging is first nailed at upper ends only. Here is another point for the inspector's watchful eye, as it is not unusual for a foreman to submit a subfloor to undue loading of material before the lower ends of the bridging are made secure, with the result that the joists, not thoroughly dry, receive a permanent sag, which may be so slight as to remain unnoticed until the building is occupied. Sagging of joists may also be due to insufficient attention to reinforcement of headers and trimmers around stair wells and other openings through floors and roofs. Such headers and trimmers should always be specified to be doubled (unless quite short), and must be well spiked together and have good end supports. Ends of headers resting on trimmers should have special attention. Adequate steel joist hangers are inexpensive and should be employed in such locations; also for the ends of tail joists resting against headers, in cases of spans of the lengths encountered in store buildings, school houses and the like. All such anchors and the supported joist ends must be so matched and placed as to guarantee tight bearings and no settlement.

Joists occurring under, and parallel with, partitions are also doubled and must be well spiked. Where such partitions are used as runways for piping, the double joists should be rigidly blocked apart, to permit pipes to pass between. Joists under bathroom floors should be specially framed (not cut out) to accommodate the larger piping, unless such work can be carried down below the floor and left exposed, or concealed by a suspended ceiling. Excess cutting of joists is customarily guarded against by a specification clause to the effect that "no cutting of either the upper or lower edges of any joist will be permitted farther than 2 feet from either bearing, nor deeper than 2 inches in any location; nor on more than one edge near the end of any joist. No holes larger than 1 inch may be bored through any joist without special permission," which, in practice, leaves the determination as to permissible

mistreatment of joists up to the superintendent to a considerable extent.

The same precautions apply to studding, though in lesser degree. Sustaining chiefly end loadings, studdings are readily reinforced if misused. This should by no means be neglected. Studdings are doubled around openings, chiefly to afford good nailing for wood trim. This reinforcement of jambs need be nothing more than continuous blocking, except for wide openings where adequate supports are demanded for the bearing ends of lintels or trusses. These features, where not deemed of enough importance to warrant special detailing, are ordinarily left to the building foreman, who should be dependable, but must be carefully checked. This is urgent, if openings are over 6 feet wide, or where tracks for sliding doors or folding partitions are to be supported. Plates for studding walls and partitions are usually single at bottom and double at top, the latter in lieu of splicing at ends and corners. Bottom plates are generally nailed on the subfloor, and the spacing of studding marked on them, regardless of openings, which are cut out and framed after the studdings are erected. After erection, all lines of studding should be carefully plumbed and aligned, and maintained rigid by stay bracing until reinforced by sufficient sheathing. All top plates, as well as all other framing members, should be thoroughly spiked or bolted, as specified. Plates on masonry walls are anchored at intervals by means of bolts and anchors built into the wall, though such anchorage is frequently omitted over basement walls in frame buildings.

In the matter of wood trusses, there is apparently an increasing use of patented designs, either carried in stock or made to order. These must be inspected for conformation to specification requirements, not necessarily taken for granted. Joints of other wood trusses are always detailed (or should be) and must be faithfully followed, since the full strength of members is directly dependent upon their close and accurate joinings. The superintendent must also look to the anchorage and tying together of the whole structural framing of the building at floor and roof levels.

Laminated floors are built of members, such as 2 x 6s, close placed on edge, and well spiked together. These span from beam to beam (joists being omitted) and have joints rendered in pitch or white lead, to be waterproof. Such floor construction is generally covered with a wearing surface of finished material.

Ordinary joists are covered with 1-inch subflooring laid at slight diagonal (in most cases) so that the finished flooring can be run in either direction without danger of having a line of nailing occur over a crack. Such subflooring is not, necessarily, matched and may (unless matched) be of No. 2 or a fair quality of No. 3 sheathing, having the worst defects cut out. Unless end-matched material is used, all end joints should be cut in the centers of bearings and parallel to them, and should be staggered, not more than two or three located side by side. All subflooring should be well nailed at each bearing with two or more 8d nails, if 8 inches or more in width. For 6-inch widths, two nails at each end and one at each intermediate bearing (staggered) are sufficient. Similar sheathing is used for shingled roofs; sometimes left with open joints, so that the shingles will not retain moisture and thereby tend to rot. For flat or slightly sloped roofs and under slate or tile, the sheathing is ordinarily matched, laid at right angles to joists or rafters, and driven tight. If such sheathing is left exposed underneath, it should be of 2-inch (1¾-inch) matched lumber, otherwise the roofing nails are likely to break through. Some specifications call for 1¼- or 1½-inch material for this purpose, but matched lumber of those thicknesses is seldom carried in stock. Before sheathing is started on any roofing surface, inspection should be made of joists and rafters to check their framing, spacing and spiking. Except in the case of inclined roofs, these are simple matters. The membering of inclined roofs containing hips and valleys involves the use of applied geometry which the average carpenter has been trained to accomplish with his steel-square. If he fumbles it, he should be replaced by one who knows how. It is not a function of a superintendent to educate mechanics in this or any other phase of any craft, though he may be asked to do so. His tact should avail him in avoiding such traps.

Wood shingles are of many shapes and sizes, those most used being 16 inches long and of varying widths, generally laid from 4¼ to 4½ inches to the weather. The best shingles are supposed to be of cedar, of which a good commercial grade is known as "5-to-2 Clears," meaning that five of their butts measure 2 inches in thickness. A cheaper grade is known as "Star-A-Star" and an intermediate grade as "Extra Star-A-Star"; both of which run six butts to 2 inches. Shingle nails (of the kind specified) should be non-rusting, of length to penetrate the sheathing about ¾ inch, should be located about 1 inch under the lap of the second course above, two nails to each shingle. Shingles should be laid from ¼ to ⅜ inch apart, if dry; ⅛ inch less, if wet. For better insulation of roof spaces, shingles are sometimes laid over building paper and matched sheathing. But this is supposed to shorten the life of wood shingles, and hence experienced architects secure their insulation by other means. Neither do they paint shingles, since moisture held behind the paint is likely to cause rotting. For coloring and preser-

vation, therefore, shingles are dipped, two-thirds or more of their length, in an approved shingle stain. Such shingles may be purchased in bundles, factory dipped, or may be hand dipped at the building. In the latter event, the inspector must make sure that the stain is as specified and that it is not improperly diluted with benzine or other injurious admixture. Some specifications call for an additional coat of the stain to be applied after the shingles are laid. For this, the superintendent should insist on there being a sufficient time after laying for him to readily observe that complete coverage is effected. Asphalt shingles are frequently substituted for wood and are considered a better fire hazard. They are also better adapted to curved surfaces, but sometimes show a disposition to curl. They should be applied strictly as directed by the manufacturers.

Side wall sheathing, especially for residences, is usually specified to be matched and of better quality than that for floors and roofs, because of its function as an insulating material. To give added stability to the framing, the sheathing is applied diagonally. Additional insulation is provided by the use of certain approved materials applied over the sheathing or secured by edge stripping between the outside studding; sometimes by both methods. See detail in Fig. 17 (a), Chapter 20. Sometimes, the entire studding spaces are filled with mineral wool or other loose-packed insulating fiber or powder. Whatever the material, it is important that the smaller interstices around window and door openings and other framing be as adequately protected as are the larger spaces. Such details may be neglected if not watched.

Various sheet insulating materials are offered for application over outside sheathing, to be covered by the siding, stucco or veneer, as the case may be. The superintendent must make himself acquainted with whatever is called for, and the correct manner of its placement. The least that may be demanded for such insulation is a good brand of building paper. Ordinary "rosin-sized" paper tears so easily that a better grade, such as a hard-surfaced black impregnated paper, is greatly to be preferred, in one or two thicknesses. It should be well lapped and tacked in place, just ahead of application of finished wall covering, so as not to run the chance of being torn by the wind or other agency. It should be extended behind all outside casings, to effectually cut off air passages around frames. All torn places should be given an added thickness. All insulation against heat or cold resolves itself, so far as concerns the inspector, into a knowledge of what has been determined upon, and then seeing that it is correctly applied in required quantity, adequately secured, and properly protected until incorporated into the building structure.

Studding spaces should also be cut off in each story at mid-points between floors, by bridging "herringbone fashion," with material of the same width as studs. This should be applied also to partition studding, and serves both as stiffener and to interrupt the free passage of fire and vermin. It is usual also, in better class work, to fill the spaces between the wall ends of first floor joists of frame buildings, with brickwork extending up to the underside of subflooring. Sometimes a similar firestop is built between ends of second story joists, or on the subflooring of the second floor. In buildings with masonry walls and sloping roofs, the brickwork should be continued up between rafter ends to the under side of roof sheathing, as shown in The Forum for April, 1930.

ROOFING AND SHEET METAL WORK
CHAPTER 20

ROOFING and sheet metal work, though belonging to quite independent trades (several trades, in fact), are so frequently combined under one contract that they are often thus united in specifications. In the school building we have under consideration, the contract called for a tile roof laid over 30-pound impregnated felt on a surface of dressed-and-matched plank, and guaranteed for five years from date of acceptance of the general contract. The tile were of a certain make, color and design, to conform to approved samples. Our superintendent inspected them as unloaded, then ordered that they be sorted to cull out many of lighter shades than the palest of the samples. Though such color is not in itself adequate reason for condemning, it was evident that these were insufficiently burned and might disintegrate in weathering. The roofing contractor wired for a representative of the manufacturer, who, on arrival, ordered the tile culled and the culls hauled away to be sold as seconds.

The laying of slate and tile roofs is essentially a performance for experts. One has but to see that they know their craft and are willing to comply with instructions. Special care is always demanded at eaves and at the ends of courses, over rakes and valleys, and under hips and ridges. Each tile or slate must be correctly aligned and well secured in the manner specified, as they are likely to work loose under the influence of wind and freezing. Similar precautions must be taken

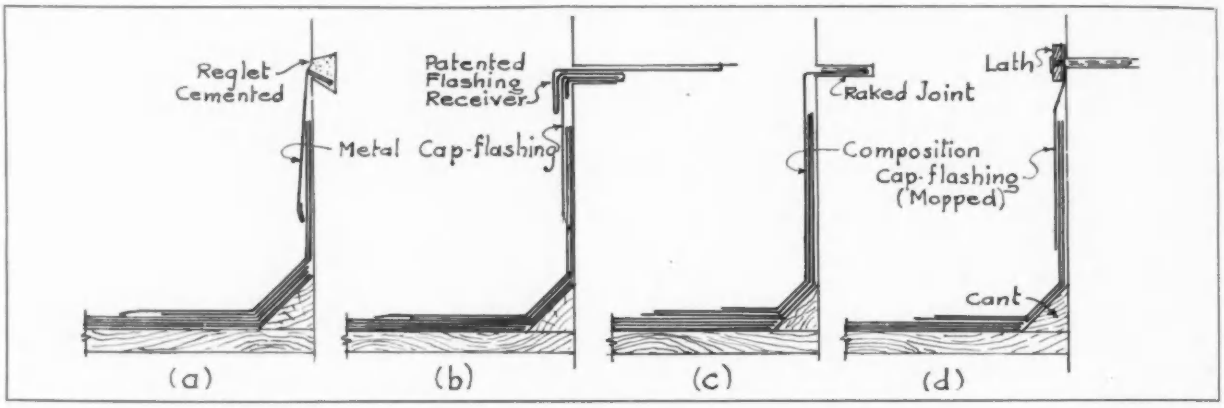


Fig. 15. Types of Sheet Metal and Composition Flashing

in the laying of the various imitations of tile and slate. Certain of these, made chiefly of Portland cement, are designed to be secured directly on purlins. They are interlocking at ends and sides, to be practically weathertight, but possess poor insulating quality, and hence are subject to collection and dripping of condensation over heated areas. The same is true of corrugated asbestos lumber and similar manufactured boards, intended to be laid directly on purlins to form simple inclined roofs. Skylights are formed in such roofs by the occasional introduction of sheets of wire-glass of the same form as the tile or corrugated boards, and secured in the same manner. These roofs are generally applied under the makers' recommended specifications, and are guaranteed by them.

Roofing slate, as at present quarried, is marketed in so many and varied shapes, sizes and shades that standards are seldom fixed by specification, but rather by approved samples. The producer's certificate accompanies each shipment and should be demanded by the superintendent. It is his chief reliance, but he should also inspect each delivery and, incidentally, make sure that he is tendered the particular certificate applicable to his order.

One of the superintendent's chief concerns in connection with any and all roofing is to see that it is applied only on surfaces and members in proper condition to receive it. In strictly fireproof construction, unless the roofing members are laid directly on purlins, as already described, roof slabs are constructed of concrete or hollow tile of various forms, and the slate or roofing tile laid thereon, generally over heavy felt. To receive the nailing, the tile or concrete subsurface should be of a density to permit the nails to be driven and *held;* or wood strips should be anchored to the roof slabs along the lines where nailings are to occur. On all tile and slate roofs, the flashing in every angle and at every intersection with other material must receive the best attention,—that done by the roofer himself, as well as that of the sheet metal worker, the plumber and others. If there is a leak, it is always the other fellow's fault. The superintendent should know whose is the fault, or, better still, see that there are no leaks.

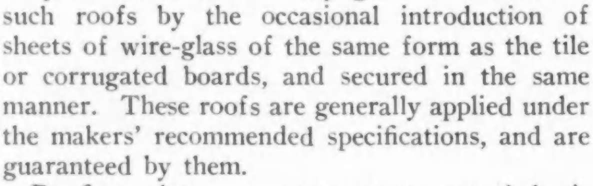


Fig. 16. Seams in Sheet Metal Roofing

Tile, slate and stone tiling are also used on flat roofs and decks intended for use as promenades. Such a roof must first have a watertight surface, made in the customary manner, of membrane waterproofing or of from 3- to 5-ply composition roofing. Over this, the tiles or blocks are laid in cement mortar or mastic as specified, sometimes in special patterns and jointing; sometimes, with tile or concrete base against walls, to take the place of flashing. So-called "flat" roofs may incline as much as 10 or 15 per cent, or may be as flat as floors, and yet be equally serviceable, if properly constructed. Composition roofs are either built-up (at the site) or ready-prepared. If built-up over wood sheathing, it is first covered with a layer of building paper to prevent the hot pitch from seeping through the sheathing. If laid over concrete, the slab should be given a fairly smooth troweled finish, usually done with a thin rich topping, and the dry sheet omitted. Use of ready roofing is impracticable over concrete, unless laid in mopped pitch, in same manner as impregnated unfinished felt. On the other hand, built-up roofing should not be applied to surfaces of greater incline than ¾-inch in 12 inches, without definite knowledge that the pitch used has a melting point high enough to prevent its flowing when subjected to summer heat. The liquid asphalt or tar pitch used must

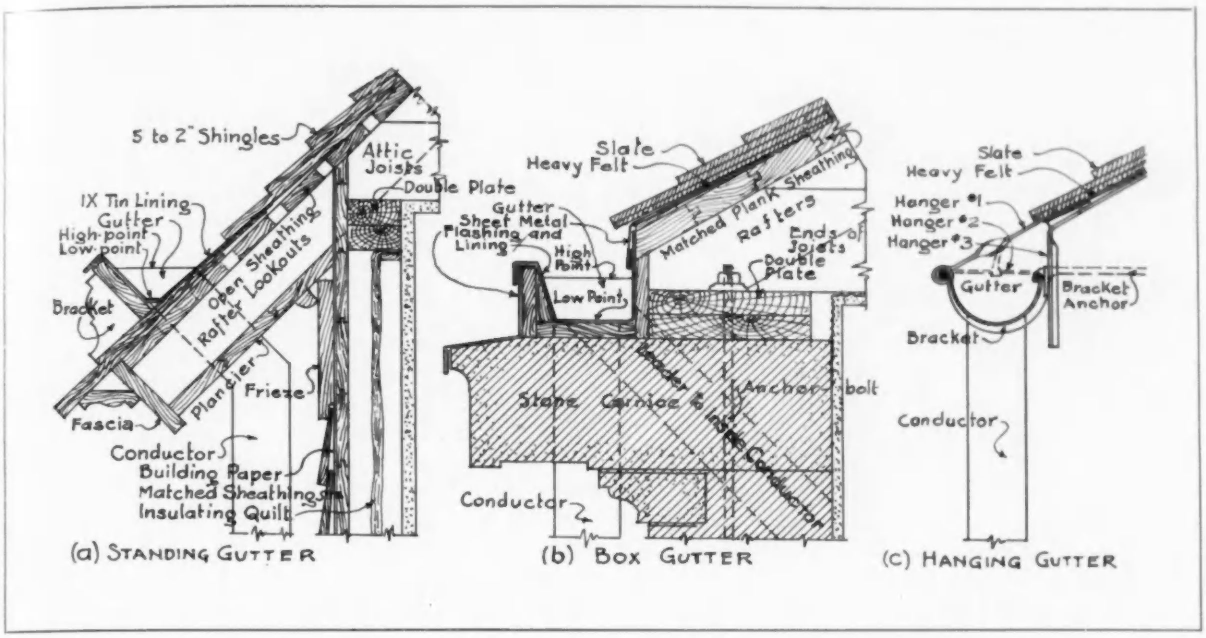


Fig. 17. Usual Types of Gutters

also be similar to that with which the felt is impregnated.

Built-up roofs usually consist of from 3 to 5 plies of tar-rag-felt, asphalt-rag-felt, or asphalt-asbestos-felt, with moppings of the same material with which the felt is saturated. Over the final mopping is spread a layer of gravel, crushed stone or crushed slag, from ¼-inch to ⅝-inch in depth. This should be free from dust or other fine particles and from coarse pebbles, and should be of the quantity specified per square, evenly distributed. It should not be used on areas of greater incline than 1 inch in 12 inches, as it will tend to work down toward low points and get into gutters and drains. Low ridges are generally provided along eaves over gutters and around conductor openings, to act as "gravel stops."

Whether a contract calls for ready roofing or built-up roofing of a given number of plies, the superintendent has recourse to a very definite description of materials and procedure, and has but to see that all instructions are faithfully carried out. He is further aided, in nearly all instances, by a specification clause calling for a positive guaranty that the roofing, thus applied, will remain weatherproof for a certain number of years, usually 5, 10 or 20, dependent upon the quality and quantity of materials called for. But such guaranties may not cover the flashings (sometimes installed by another contractor or sub); they do not protect against damages caused by others than the roofers; and they offer no insurance against injuries done to other parts of the building or contents due to defects in the roofing. A more satisfactory guaranty, for both the owner and architect, is one which includes both the roofing and flashing, whether the latter be of metal or of the roofing materials. If metal flashings are used, attention should be given to the shape of the reglet, in which the upper edges of the flashing are to be secured. This must be as detailed (pre-formed or cut in the masonry), and at the proper height above the roof to permit ice to form, without danger that melting snow or slush will overflow the upper edge of the sub- or base-flashing.

The joining of flashing and roofing may be considered the weakest point in roof covering, and hence must be given the most careful attention. Fig. 15 (d) illustrates usual construction in the use of "self-flashing," i.e.: with the cap- or counter-flashing made of material similar to that of the roofing. The weakest feature of such flashing is the nailing of the strip (usually an ordinary lath) along the top edge into the mortar joint. This can be bettered by laying a nailing strip in the joint along this line and seeing that it is made secure. The chief advantage of self-flashing is that it is mopped to the base-flashing and to the wall, yet has enough pliability to render cracking improbable. A modification of this method of flashing is shown in Fig. 15 (c), a patented cap-flashing to which anchor clips are attached, thus doing away with the wall strip.

Sheet metal roofing materials in most common use are copper, zinc, lead and steel or iron plates, galvanized or tin-coated. The specifications for the material and laying of each of these are well standardized and must be closely followed, and the conditions of the guaranty carefully noted.

All such roofing, except heavy corrugated sheets, is attached by the nailing of lugs secured in seams of joints (see Fig. 16), to avoid surface perforations; though there is a sheet lead roofing sold in rolls like roofing felt, and laid in similar fashion, with mopped joints. For adequate nailing, the lighter gauge sheet metals are applied in small sheets over matched wood sheathing, covered with good building paper, well lapped and secured. Tin plates are of two standard weights (thicknesses), known as "IX" and "IC." IC is approximately No. 30 gauge (U. S. Standard), and is the weight ordinarily used for roofing. IX is about No. 27 or 28 gauge, and is used for gutter linings, etc. For these purposes (roofing, etc.), the coating is a combination of tin and lead, forming what is technically known as "terne plate" to distinguish it from the "bright tin" (pure tin-coated) used for domestic utensils, etc. Both are indiscriminately called "tin." Tin and terne plate are rated according to the amount of coating,—10 to 40 pounds on a given number of plates. The 30- to 40-pound plates are regularly used for roofing, and the 20-pound for tin-clad doors and similar interior work. The maker's mark stamped on each sheet gives (generally) thickness of plate and weight of coating.

Sheet metal on flat roofs and those of low incline is ordinarily laid with flat seams, whereas standing seams are used for roofs inclined about 5° and more. See Fig. 16 (a) and (b). Standing-seam construction is especially suited to materials such as copper, subject to excessive expansion and contraction. Seams of tin are locked and soldered, while those of copper are rendered in white lead putty, except where danger from expansion is nil and soldering is demanded. V-crimped ribs are sometimes used for copper or zinc, and larger ribs of special design are sometimes built over wood cores as shown in Fig. 16 (a). All metal roofing should be laid over good building paper. That under tin should be rosin-sized, since neither tar, asphalt nor graphite should have contact with tin roofing. This applies to both paper and paint.

The first painting of terne and galvanized sheets is customarily done by the sheet metal workers and, for exterior work, includes one or two coats on concealed surfaces. For shop coats, the makers recommend "15-pound red lead to one gallon of raw linseed oil, with not more than ½ pint dryer," or "white lead, iron oxide, metallic brown and venetian red." They particularly caution against the use of turpentine or patented dryers in paint used on tin. The use of anything but rosin as a flux in soldering tin is forbidden.

Solder must be strictly "half-and-half," that is, half tin and half lead; and, to prevent the use of scrap, should be in original bars bearing the imprint of the maker. All terne and galvanized sheets should be painted within three days after being exposed to the weather, but should not be laid nor painted in wet or cold weather. Final coat should be applied shortly before the work is accepted. The practice of allowing tin to weather until rust spots appear (on the theory of giving better paint adhesion) cannot be too strongly condemned. Such action is sufficient reason for rejection of the entire tin work. The surface should be thoroughly cleaned and all traces of flux removed before painting. Galvanized sheets, being zinc coated, are less susceptible to injury by weather or acid. The makers recommend the application of an acid solution on exterior galvanized sheets, allowing it to dry for 24 hours before applying the first coat of paint.

Storm water from roofs finds its way to gutters or roof outlets, and is conducted thence by means of leaders and down spouts ("conductors"). Roof outlets are fitted with short spouts opening directly into conductors, or through scuppers in side walls, with extensions into conductor heads. All such connections must be carefully designed and constructed to guard against leakage. In cold climates, all pockets in which water can collect while freezing must have enclosing walls so constructed that the force of expansion in freezing will act against beveled surfaces and be harmless. This applies equally to gutters and to hoppers. The latter should be avoided, since they serve to collect rubbish which tends to choke the outlet. "Roof connections" of standard designs can be had for all the various types and capacities of flat roof drainage. All roof and gutter outlets should be protected with strainers of copper wire or perforated sheet copper; or of galvanized iron, if gutters are of that material. Copper and galvanized iron (or steel) are not used in conjunction, because of the adverse action of zinc and copper on each other.

Gutters are either "standing" (Fig. 17 (a)), "box" (Fig. 17 (b)), or "hanging" pendant from the eaves (Fig. 17 (c)). The latter type is constructed of zinc, hard lead, copper, tin or galvanized sheets; and the other forms have linings of the same, and are sometimes faced with sheet metal. Standing gutters are also formed of galvanized sheets, self-supporting. Gutters or their linings must be evenly sloped from their high points to outlets, and must be well secured and flashed, if built in connection with the roof surface. If of copper, they must have ample provision for expansion and contraction. Hanging gutters should have adequate rigid hangers and brackets, and a rolled outer edge containing a ⅝-inch (or heavier) continuous rod of the same material, to make it stout enough to support the head of an inclined ladder.